WETLANDS OF THE FRASER LOWLAND, 1989: Summary Report

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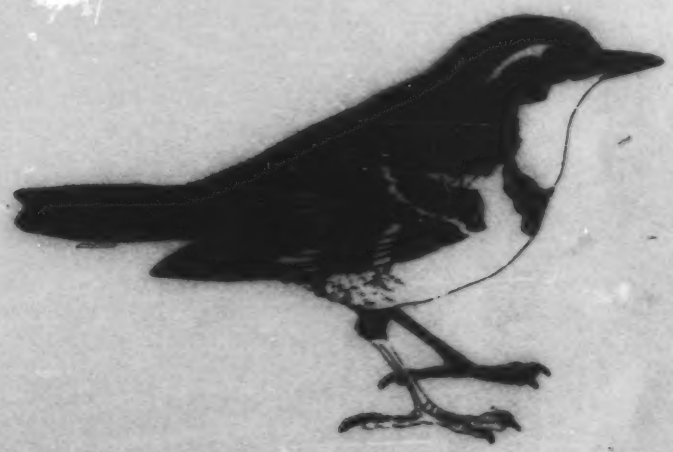
Peggy Ward



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Pacific and Yukon Region 1992
Canadian Wildlife Service

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ABSTRACT

This report summarizes the complete wetlands inventory report (published in June 1992 as Technical Report Series No.146) which answers the following questions: Where are the remaining wetlands? What size are they? What wetland classes do they represent? What state are they in? The wetland units were classified according to the Canadian Wetland Classification System. The results of the inventory show that there are 41,906 hectares of wetland left in the study area, representing 13.6% of the total area. Nearly two-thirds (64.4%) of the total wetland area is accounted for by the 'shallow water' wetland class, most of which is comprised of large tidal flats at the mouth of the Fraser River and in Boundary Bay. The other third includes 14.6% marsh, 7.5% gravel bar, 5.7% fen, 4.5% bog and 3.4% swamp. About 72% of the wetland area in the Fraser Lowland was given the highest of a three-level rating system, ie. 'undisturbed'. Excluding the tidal flat category ('shallow water' wetland class), 60% of the remaining wetland area has the highest rating. The maps and wetland measurements were generated by the SPANS Geographic Information System (GIS) as a pilot application of this technology; the use of this methodology is discussed. The complete report includes an index map at 1:127 500 showing all of the wetland units (but not identifying them individually), 29 maps at approximately 1:50 000 identifying each of the 398 wetland units, inventory data for each of these units and a dBase III file containing the raw data.

RÉSUMÉ

Le présent rapport résume l'inventaire des terres humides publié en juin 1992 (Rapport technique n° 146), lequel répond aux questions suivantes: où se trouvent les terres humides qui existent encore? Quelle est leur superficie? De quels types de terres humides s'agit-il? Dans quel état sont-elles? Les terres humides inventoriées ont été classées suivant le système de classification des terres humides du Canada. D'après l'inventaire, la superficie des terres humides est de 41 906 hectares dans la région étudiée, ce qui représente presque 13,6 % de la superficie totale. Près des deux tiers (64,4 %) des terres humides appartiennent à la catégorie des terres humides «peu profondes»; il s'agit principalement des grandes battures situées à l'embouchure du fleuve Fraser et dans la baie Boundary. Le dernier tiers se compose de marais (14,6 %), de barres de gravier (7,5 %), de tourbières minérotrophes (5,7 %), de tourbières oligotrophes (4,5 %) et de marécages (3,4 %). Environ 73 % de la superficie des terres humides situées dans les basses terres du Fraser ont été classées «non perturbées», la classe la plus élevée d'une classification à trois niveaux. A l'exception de la catégorie des battures (terres humides de la classe des «eaux peu profondes»), 60 % des autres terres humides ont été classées dans la catégorie la plus élevée. On traite également des cartes et des mesures obtenues sur les terres humides au moyen du système d'information géographique (SIG) SPANS ainsi que de la méthodologie utilisée. Le rapport complet comprend une carte-index à l'échelle 1:127 500, qui montre toutes les terres humides (non identifiées séparément), 29 cartes approximativement à l'échelle de 1:50 000 qui montrent chacune des 398 terres humides, des données d'inventaire sur chacune de ces terres et un fichier dBase III contenant les données brutes.

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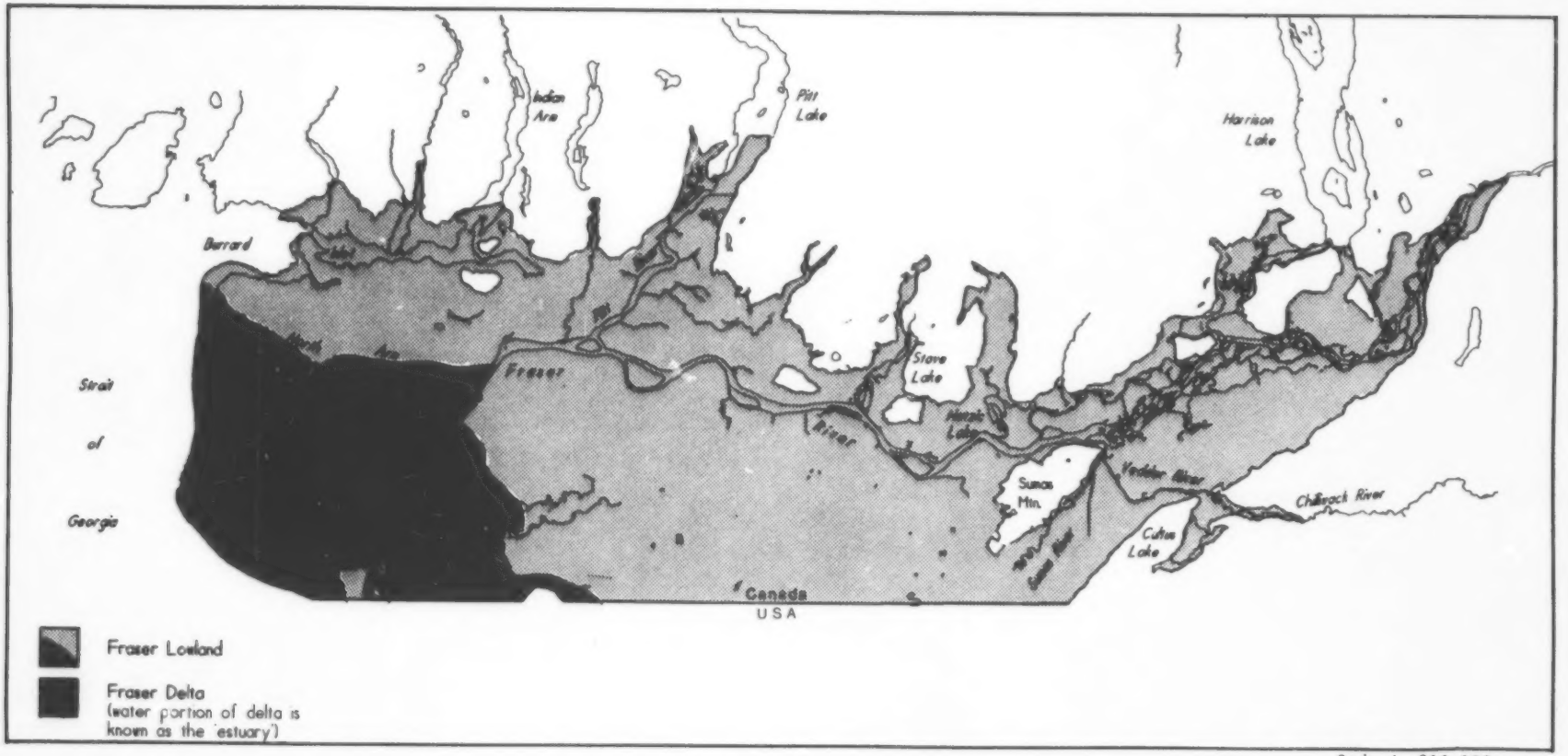

Fig. 1 Fraser Lowland

WETLANDS OF THE FRASER LOWLAND, 1989
Summary Report

INTRODUCTION

This report summarizes the complete wetlands inventory report published in June 1992 (Ward et al. 1992). The complete report contains detailed inventory data on 398 wetland units in the Fraser Lowland. It also contains 29 maps at a scale of approximately 1:50 000 identifying each wetland unit as well as an index map at 1:127 500 showing the location of all the wetlands (but not identifying them individually). A dBase III file containing the raw data is also included in the complete report.

BACKGROUND

Extensive wetlands existed throughout the Fraser Lowland for thousands of years, providing valuable habitat for large numbers of fish and wildlife. The area remains an internationally important stopover for hundreds of thousands of migratory birds on the Pacific Flyway, while the Fraser River itself is the largest single salmon-producing stream in the world.

Since European settlement began about 150 years ago, however, thousands of hectares of these vital wetlands have been destroyed, due to large-scale dyking, draining and filling for urban and agricultural development. Over half of the population of British Columbia currently lives here, and the area's attractive climate, landscape and economy is expected to continue to attract large numbers of people. In fact, the Lower Mainland has one of the fastest growth rates in the country, resulting in many conflicting demands for the use of the remaining wetlands.

The remaining pockets of valuable wetland identified in this inventory must be recognized and protected if they are to continue to support the valuable fish and wildlife resources of the region.

This report presents a regional picture of wetlands against which an individual wetland may be measured. If site-specific assessments are required, detailed surveys must be undertaken. Specifically, the report answers the following questions:

Where are the remaining wetlands in the Fraser Lowland?
What size are they?
What wetland classes do they represent?
What state are they in?

STUDY AREA

The Fraser Lowland is located in the southwestern corner of mainland British Columbia and northwestern Washington State. It is triangular shaped, with its apex near Hope in the east, where the river exits from the Coast Mountain Range, and its base in the Strait of Georgia to the west (Fig. 1). The base of the triangle extends from Burrard Inlet in the north to Bellingham Bay in the south. The Fraser River flows through this area of gently rolling upland and extensive floodplain, and at its mouth forms the largest delta (678 sq. km.) on the Pacific coast of Canada.

This report deals only with the Canadian portion of the Fraser Lowland; it measures 3092 square kilometres and accounts for approximately two-thirds of the total lowland area. The study area corresponds to the Fraser Lowland Ecosection, a subdivision of the Lower Mainland Ecoregion as identified by Demarchi (1988). It is also defined as that area below 150 meters in elevation, which is considered to be roughly the area of maximum marine overlap before the land rebounded after the last glaciation. The seaward boundary for this study is 10 meters below the lowest normal tide level.

METHODS

Wetland Identification

Initially a bibliographic search was conducted to locate wetlands in the Fraser Lowland and preliminary maps, at 1:50 000, were prepared. Analysis at this stage indicated that more detailed information was necessary. Since separate detailed habitat inventories of the Fraser River Estuary Management Program (FREMP)[1] area were under way (see Fig. 2), it was decided to conduct a complementary inventory outside the FREMP area. The results of this CWS inventory and the FREMP inventories have been amalgamated in a dBase IV database file for the purpose of this report; this file was converted to dBase III for distribution purposes and is provided on the diskette at the back of the report. Altogether 398 wetland units are described.

Air photo interpretation was used to identify wetlands for the CWS inventory. For most of the area, large scale (1:12 000) colour air photos, taken at low water in September 1986, were available. Areas not covered by these photos include Burrard Inlet, the Central Fraser Valley uplands, and the outer tidal flats. For Burrard Inlet, black and white 1987 photos at 1:10 000 were used. Coverage of the remaining upland areas was not as detailed and a number of different scales of photos were used ranging from 1:15 000 to 1:40 000; these were taken

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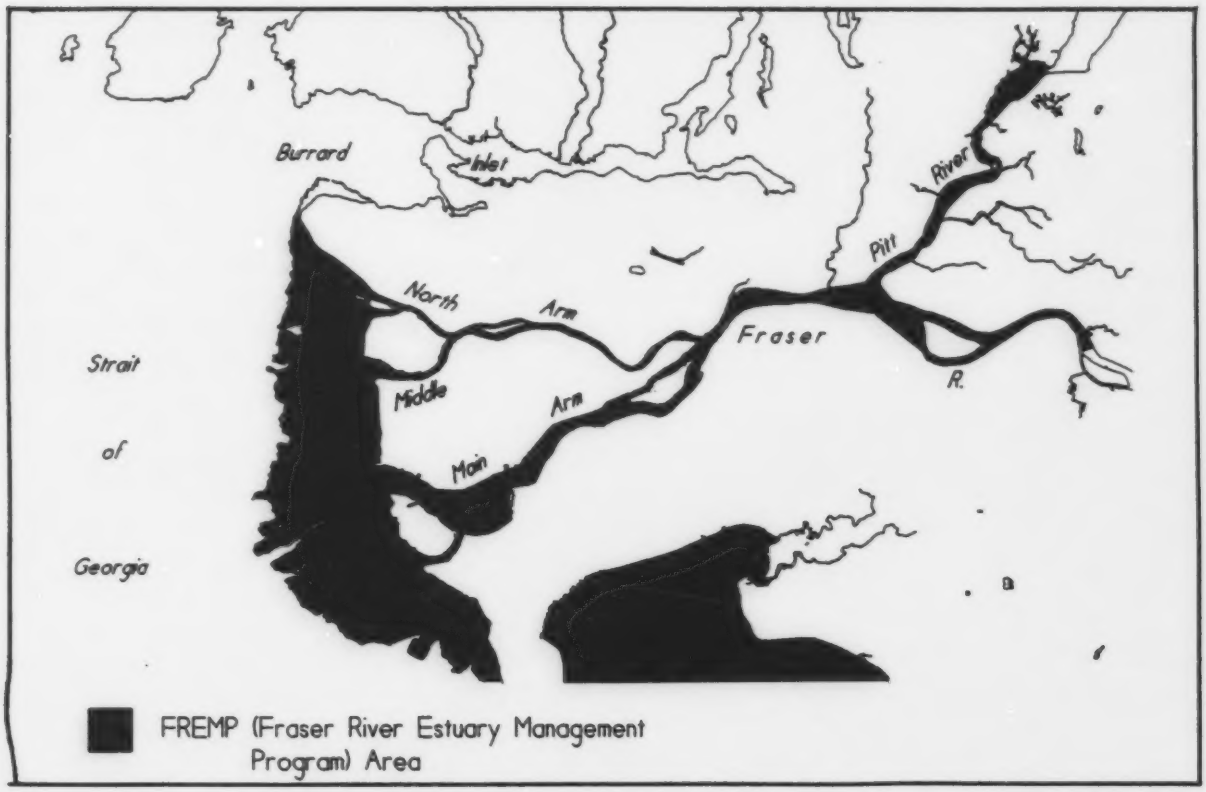
[1] FREMP is a coordinating body comprising the various agencies which share control over the Fraser River Estuary. It was created in 1985 through federal - provincial agreement 'to provide the means for accommodating a growing population and economy, while maintaining the quality and productivity of the Fraser Estuary's natural environment' (FREMP 1986). FREMP's Habitat Management Goal is 'to maintain and where feasible increase the productivity of fish and wildlife habitat' (FREMP 1986). To this end, habitat inventories within the FREMP area were conducted during the late 1980's (FREMP 1990a, 1990b).

Fig. 2 FREMP Area



during 1983 and 1984. Specific air photo sources are cited in the data report for each wetland unit. Since complete large scale air photo coverage of the outer tidal flats was not available, the outer edge of the flats was determined to be chart datum (lowest normal tide level) from the Canadian Hydrographic Chart No. 3463 (1988).

Wetlands, one-half a hectare or greater, were outlined on these air photos and were then field checked during the summer of 1989. Each wetland site was visited to verify these wetland boundaries, to classify each wetland unit, and to estimate the proportion of different vegetation types and the degree of disturbance. Many of the wetland units are large and complex in vegetational structure and access was difficult. Thus, the classifications are provisional since they are based primarily on air photo interpretation and field spot-checking. It is important to note, therefore, that detailed vegetation surveys will still be required for site-specific evaluations.

are based primarily on air photo interpretation and field spot-checking. It is important to note, therefore, that detailed vegetation surveys will still be required for site-specific evaluations.

In order to include eelgrass beds in the inventory, colour infrared aerial photography was flown specifically for this project. It was taken in late June 1990 at the time of lowest low water for that summer. This photography did not cover Semiahmoo Bay or the area south of the Tsawwassen ferry jetty. For those areas, the 1:12 000 colour air photos from 1986 were available. Photo mosaics were made and the eelgrass beds were then outlined. Due to time constraints, the resulting maps were not verified by field inspection; however, field checking is essential if the exact extent of these important eelgrass beds is to be determined. Areas of particular concern are the discontinuous beds at the seaward edge of the flats in Boundary Bay and off Ocean Park. Field checking of this air photo interpretation is expected to be done in 1992.

GIS and the Wetlands Inventory

The CWS wetlands inventory was developed using a Geographic Information System (GIS)[2] as a pilot application of this technology. This decision was due primarily to the increasing use of GISs in resource management. The linking of the database file with the digital wetland unit maps in the GIS allows numerous combinations of query and analysis. When combined with other resource databases, the resulting information can exceed what traditional paper maps provide. These potential benefits warranted the significant effort expended in extracting information from air photos and processing it to its final format in the GIS.

All of the maps in this report were generated by the PC-based GIS software called SPANS. The digital wetland units are displayed on base maps digitized[3] by CWS from the 1:50 000 National Topographic System (NTS) mylar maps; this was done under agreement with Energy, Mines and Resources Canada.

In order to have both the CWS and FREMP inventories available on the GIS, it was decided that the FREMP-inventoried wetlands would also be digitized, but for display purposes only; the measurements of the FREMP-inventoried wetlands were already available (FREMP 1990a, 1990b). Due to the disparity in scales at which the two inventories were conducted, the 1:2500 FREMP inventory maps were manually converted to 1:25 000 prior to digitizing, a scale more closely approximating the CWS work. Since this scale is ten times more generalized than the original, small pocket marshes were combined into larger units. Where wetland units from both inventories overlap, the FREMP wetland was incorporated within the larger CWS unit.

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[2] A GIS is a computer-based system that combines database management and computer mapping to produce, organize and analyze spatial information.

[3] Digitizing is a process whereby information on paper maps is converted into digital form and stored on computer.

There are only seven such units and the size of the FREMP wetland is specified in the notes of that wetland unit.

Wetland Measurement

The verified boundaries of each wetland unit were transferred manually from air photo mosaics to mylar sheets at the same scale. Each unit was digitized and georeferenced to a digital base map in the GIS in order to obtain accurate measurements. Where wetland units were too narrow to show as polygons on the air photos, ie. narrow streams or sloughs, linear measurements were taken using Generic CADD (Computer Assisted Design and Drafting) and a digitizing tablet and then multiplied by an estimated width.

These measurements were then entered into the amalgamated CWS-FREMP inventory database. As mentioned above, the measurements of the FREMP-inventoried wetlands were taken directly from those inventories (FREMP 1990a, 1990b).

Wetland Classification

The Canadian Wetland Classification System (CWCS) (National Wetlands Working Group 1987) was used for this inventory. It was developed by the National Wetlands Working Group of the Canada Committee on Ecological Land Classification. The system is 'provisional' in that it has not yet been fully applied and tested throughout Canada.

The CWCS contains three hierarchical levels: *class*, *form* and *vegetation type*. Five wetland *classes* are recognized on the basis of the overall genetic origin of wetland ecosystems; they are **bog, fen, marsh, swamp,** and **shallow water.** Seventy wetland *forms* are differentiated on the basis of surface morphology, surface pattern, water type, and morphology of underlying mineral soil. Wetland *vegetation types* are classified according to vegetation physiognomy. For a description of the various CWCS categories found in this study area, please refer to Appendix E.

There was some difficulty in applying this national system to the Fraser Lowland Ecosection. There are few such large and complex riverine systems in Canada encompassing large tributaries. It was found that many of the wetland units could fit more than one of the CWCS's 'form' categories depending on whether the unit was compared to the whole ecosystem or to a smaller system within the larger one. Other features could not be accommodated within the classification system at all. Gravel bars and floodplain forests, in particular, were difficult to classify even though they are significant and prominent features of this wetland ecosystem.

Gravel bars were added as a separate wetland 'class' for the purpose of this inventory. They function as wetlands due to periodic inundation, seasonal high water tables and adaptive vegetation. They are distinct from other wetlands in that there are generally no well developed soil horizons. Also, these wetlands are subjected to the force of the Fraser River peak discharge

each year, and are therefore often transitory in nature. Instability and change is pronounced in these wetlands until the bed profile rises above the level of annual river flooding. They are also geographically distinct from other classes of wetland occurring only at the eastern end of the Fraser Lowland. Because gravel bar wetlands undergo rapid successional change, three successional categories (early, mid and late) were used to describe these systems.

- Floodplain forests, on the other hand, were 'forced' into the existing system by classifying them as 'floodplain swamps' for lack of a more appropriate classification. 'Swamp' was considered to be an inappropriate category because these floodplain forests do not support standing water for most of the growing season. These predominantly cottonwood forests are also an integral part of this wetland ecosystem; they have developed on the undyked shorelines and islands in the floodplain and are hydrologically linked to river flows.

It should be noted that cottonwood forests which grow on the Fraser River gravel bars upstream of Sumas River are not separated out as floodplain swamps but rather are dealt with as part of the gravel bar unit.

Wetland Evaluation

Each wetland was evaluated during field inspection on the basis of its level of disturbance. A three level rating system was used to indicate the relative amount of apparent human disturbance on the wetland from agriculture, roads, dyking, ditching, filling etc. A value of '1' represents an undisturbed site; a value of '2' indicates a moderate amount of human disturbance, such as adjacent agricultural activities or road crossings, or small pockets of fill or former clearing; a value of '3' represents sites with a relatively large amount of disturbance, such as the actual removal, or filling in, of some of the wetland vegetation or sites where adjacent development has altered the wetland hydrology.

Wetlands in the FREMP area were evaluated for the purpose of this report during 1991, in the same way as the rest of the study area, ie. on the basis of the amount of human disturbance. Note that this is a different rating system from the one that FREMP developed for its own purposes. FREMP generated a three-level system of Development Guidelines from its habitat inventories (FREMP 1990a, 1990b).

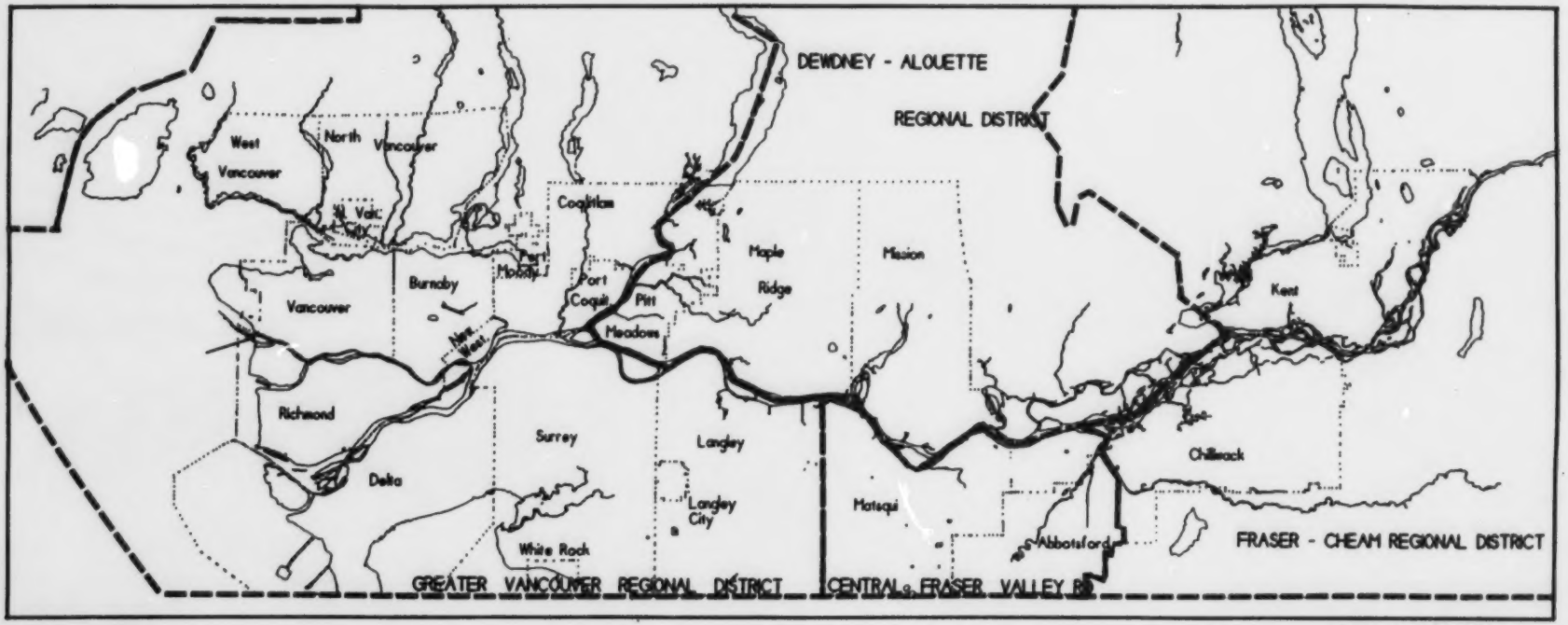
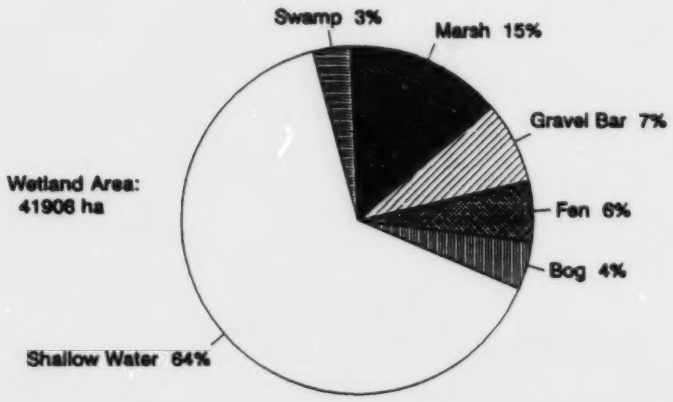
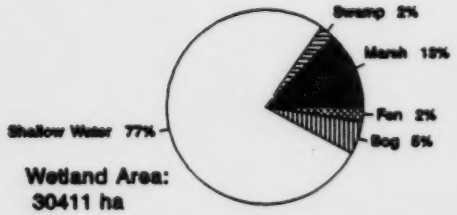


Fig. 3 Municipal and Regional District Boundaries

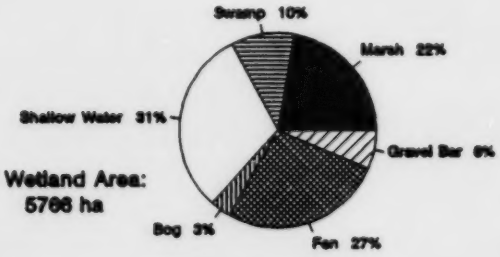
Fig 4. Proportion of Wetland Classes by Regional District



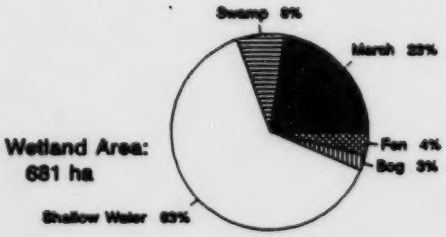
Fraser Lowland



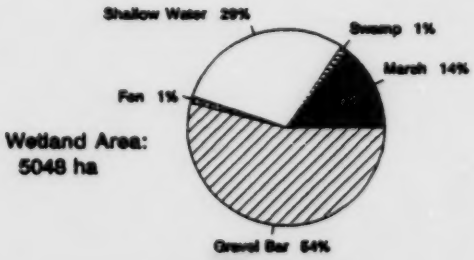
Greater Vancouver
Regional District



Dewdney-Alouette
Regional District



Central Fraser Valley
Regional District



Fraser-Cheam
Regional District

RESULTS AND DISCUSSION

There are 41,906 ha of wetland in the Fraser Lowland, representing 13.6% of the total area. Figure 4 shows that nearly two-thirds (64.4%) of this area belongs to the 'shallow water' category of wetland; it includes the large expanses of tidal flat along the Fraser River Delta Front (Sturgeon and Roberts banks) and in Boundary Bay. The remaining third is divided as follows: 14.6% marsh, 7.5% gravel bar, 5.7% fen, 4.5% bog, and 3.4% swamp. Nearly 72% of all the Fraser Lowland wetlands were rated as 'undisturbed', 22% as 'moderately disturbed' and 6% as 'highly disturbed'.

The FREMP area (see Fig. 2) includes 25,213 ha or 60% of all wetlands in the Fraser Lowland. This represents 52% of the marsh area, 80% of the shallow water wetlands, 6% of the area of fen and 18% of the swamp area.

See Appendix A for the area of each wetland class by municipality and rating. Appendix B provides a summary of the above figures for each regional district. Appendix C summarizes the area of wetland for each municipality by rating. Appendix D lists all the wetland units for each wetland class in descending order of size.

Marsh

There are 6111.7 hectares (ha) of marsh located along the shorelines of the estuary and the many rivers, streams, sloughs and ponds throughout the study area. Figure 5 shows that three-quarters of these remaining marshes are relatively undisturbed, ie. they have a rating of '1'. An additional 24% is only moderately disturbed ('2') and only 2% is rated with '3'.

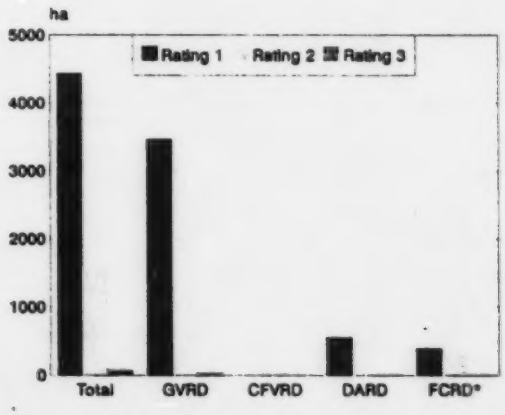


Figure 5. Marsh Ratings

Figure 6 shows that 46% (2814 ha) of all Fraser Lowland marshes are in the Fraser River Delta with the largest concentration (about 40% of the total) occurring on the delta front between Point Grey and Tsawwassen and extending upstream into the Main Arm of the Fraser River to Ladner Marsh. The second largest concentration (22% of the total) occurs in the Pitt River Valley. Other concentrations are located in the Hatzic Lake, Nicomen Island and Slough area (8%) and in the Harrison River Valley (5%).

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* GVRD - Greater Vancouver Regional District; CFVRD - Central Fraser Valley Regional District; DARD - Dewdney Alouette Regional District; FCRD - Fraser Cheam Regional District.

Fig.6 AREA (HA) OF WETLAND CLASS BY GEOGRAPHIC REGION

GEOGRAPHIC REGION	BOG	FEN	MARSH	GRAVEL	SHALLOW WATER	SWAMP	TOTAL
Agassiz/Seabird Island	0.0	0.0	93.4	0.0	144.1	0.0	237.5
Burrard Inlet	0.0	0.0	18.3	18.1	482.1	8.1	526.6
Burrard Peninsula	11.3	0.0	44.2	0.0	73.8	2.4	131.7
Burnaby Lake and Still Creek	5.5	0.0	38.7	0.0	66.4	0.0	110.6
Camosun Bog	0.3	0.0	0.0	0.0	0.0	2.4	2.7
Deer Lake	5.5	0.0	5.5	0.0	7.4	0.0	18.4
Central Fraser Valley uplands	17.4	92.1	56.0	0.0	186.0	173.2	524.7
Chilliwack Sloughs	0.0	0.0	128.3	6.8	376.6	0.0	511.7
Fort Langley to Wades Creek	28.7	33.2	320.1	0.0	223.3	288.6	893.9
Fraser River Delta	1567.4	28.3	2813.9	0.0	21581.0	164.8	26155.4
Boundary Bay	0.0	0.0	214.0	0.0	6487.4	0.0	6701.4
Burns Bog	1496.7	0.0	0.0	0.0	166.3	0.0	1663.0
Delta front (Sturgeon and Roberts Banks)	0.0	0.0	1729.3	0.0	14438.9	0.0	16168.2
Main Arm (Steveston to Annacis Island)	22.9	28.3	747.4	0.0	381.6	108.4	1288.6
North and Middle Arms	0.0	0.0	123.2	0.0	106.8	56.4	286.4
Richmond Nature Park	47.8	0.0	0.0	0.0	0.0	0.0	47.8
Fraser River, Sumas to Laidlaw	0.0	0.0	77.9	2790.5	408.1	0.0	3276.5
Harrison River Valley	0.0	11.2	322.3	190.8	767.4	0.0	1291.7
Hatzic/Nicomen	0.0	0.0	518.0	9.9	535.1	247.1	1310.1
New Westminster to Douglas Island	6.9	159.6	39.3	0.0	99.0	90.4	395.2
Pitt River Valley	196.3	1691.5	1325.0	0.0	1186.4	13.2	4412.4
Port Moody	0.0	0.0	6.6	0.0	105.0	0.0	111.6
Serpentine-Nicomekl Lowland	0.0	132.9	68.5	0.0	285.0	0.0	486.4
Sumas	0.0	45.3	157.1	0.0	302.9	0.0	505.3
Surrey Bend to Kanaka Creek	54.5	177.3	80.0	0.0	58.0	396.6	766.4
Vedder	0.0	0.0	42.8	106.6	167.2	52.7	369.3
Total Study Area	1882.5	2371.4	6111.7	3122.7	26981.0	1437.1	41906.4

Salt marsh ('coastal' marsh in this classification system) includes such plants as saltwort, saltgrass and arrowgrass. It accounts for only 4% (235 ha) of the marshes in the whole study area and just over 8% of the marshes in the estuary. Except for some very small pockets in Burrard Inlet and Port Moody, salt marsh can only be found between the two jetties on Roberts Bank and in Boundary Bay.

Brackish marsh ('estuarine' marsh) represents about 42% (2575 ha) of all marshes in the study area and 92% of the marshes in the estuary. Characterized by sedge and bulrush such Carex lyngbei and Scirpus americanus, they grow where salt and freshwater mix. They are found all along the delta front, north of the coalport jetty, and extend into the river as far upstream as Annacis Island in the Main Arm and to New Westminster in the North Arm. In Mud Bay estuarine marsh grows at the mouths of the Serpentine and Nicomekl rivers; similarly, it can be found at the mouth of the Campbell River in Semiahmoo Bay.

Freshwater marsh grows throughout the rest of the study area and accounts for 54% (3301 ha) of all the marshes in the study area. It is characterized by cattail, freshwater bulrush and sedge. Tidal freshwater marshes extend from the estuary up to Pitt Lake and upstream in the Fraser River to just east of Fort Langley; they represent 12% (410 ha) of the total area of freshwater marsh.

Shallow Water

Shallow water is the largest wetland class in the Fraser Lowland. This is due to the extensive tidal flats on the delta front and in Boundary Bay which account for 76% (20,926 ha) of all wetlands in this class (Fig.5). The rest occurs along river banks and in shallow sloughs, streams and ponds throughout the study area. Most of the wetland area in this category is rated '1'(undisturbed) (Fig.7), due to the rating of the tidal flats mentioned above; however, the majority of the wetland units in this class are rated with '2'.

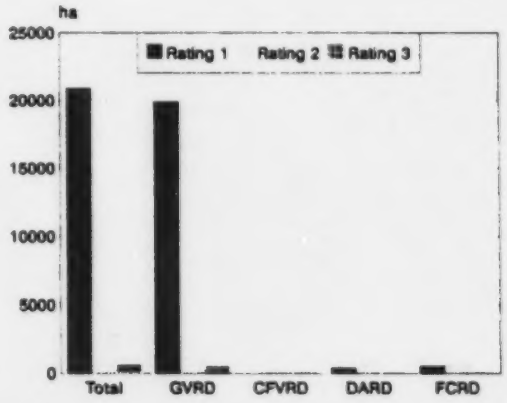


Figure 7. Shallow Water Ratings

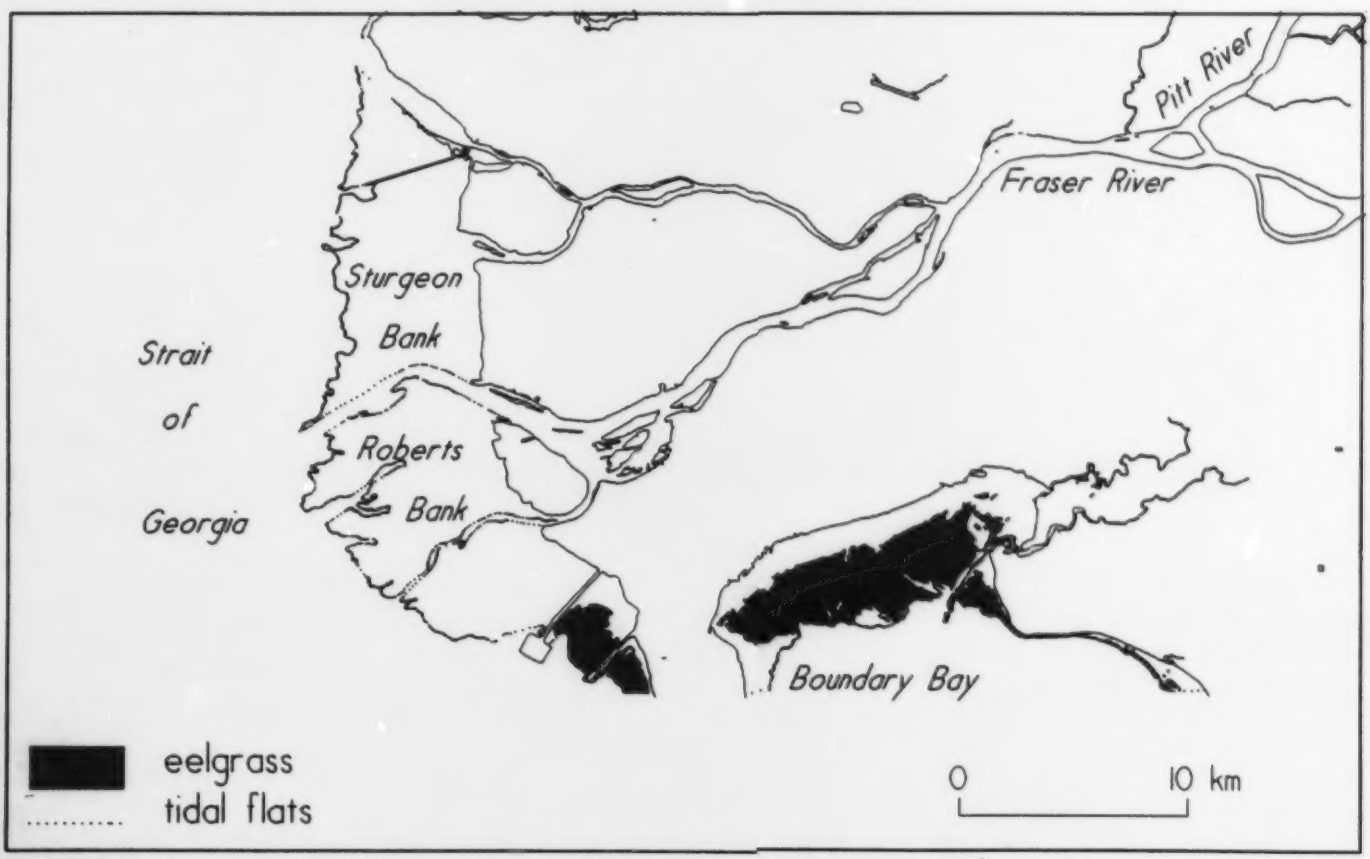
Shallow water areas often support floating and submerged aquatic plants, for example, eelgrass. Tidal flats also support populations of benthic algae, especially diatoms. It should be noted that although marshes grow on the upper portion of these tidal flats and are biophysically linked to them, they have been measured and classified separately in this inventory.

Eelgrass

Eelgrass grows on intertidal mud and sand flats in relatively protected areas and in saline waters with little suspended sediment. These conditions are found on Roberts Bank south of the coalport jetty and in Boundary and Semiahmoo bays (Fig.8). Two species of eelgrass grow here, Zostera marina and the smaller introduced species Zostera japonica. Z. japonica grows in the mid and upper intertidal zone, while Z. marina grows in the lower intertidal zone down to about 1 m below lowest low water. Eelgrass beds tend to be much more dynamic in seasonal abundance and distribution than other coastal wetland vegetation such as salt marshes.

At least 4018 ha of eelgrass grow in the Fraser Estuary. This includes only the beds of continuous cover; it does not include the patchy areas of eelgrass which grow in tidal pools off of Centennial Beach, Crescent Beach and White Rock and in some places at the lower edge of the tidal flats; these small areas were too difficult to measure. On Roberts Bank eelgrass covers about 516 ha of tidal flat between the two jetties and another 228 ha south of the ferry jetty. In Boundary, Mud and Semiahmoo bays, at least 3274 ha of tidal flat are covered with eelgrass.

Fig. 8. Distribution of Eelgrass in the Fraser Estuary



Swamp

Most (86%) of the swamps inventoried fall into the 'floodplain swamp' category; these are mostly floodplain forests (see Wetland Classification for further discussion). In the FREMP Habitat Inventory, these are the 'riparian treed' areas. Fig. 9 shows that most swamps are moderately disturbed ('2' rating).

The largest stands of 'floodplain swamp' occur in Surrey Bend and on Matsqui and Strawberry islands, accounting for over 60% of the total area of swamp in the Fraser Lowland (see Appendix D).

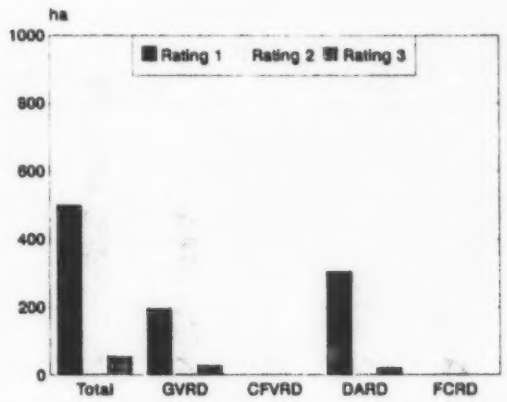


Figure 9. Swamp Ratings

Stream swamps account for 13% of all swamps and occur on the banks of tributaries throughout the area.

Bog

Burns Bog is by far the largest bog remaining in the Fraser Lowland, accounting for 80% of the total area of bog (Fig. 6). The only other relatively large area of bog occurs in the Pitt Polder accounting for just over 10% of the total. The remaining bogs are scattered throughout the study area, and include Burnaby and Deer lakes, the Richmond Nature Park, Derby Reach, Glen Valley and Judson and Laxton lakes in Matsqui (Appendix D).

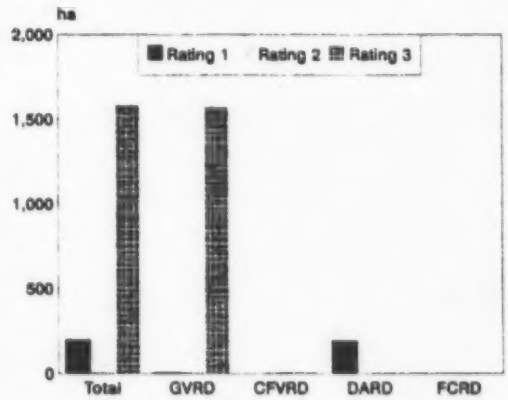


Figure 10. Bog Ratings

Figure 10 shows that most of the area of bog is rated '3' ie. disturbed - this relates specifically to Burns Bog. The other bog areas are either undisturbed ('1') or are only moderately disturbed ('2').

Fen

By far the largest area of fen is found in the Pitt River Valley, representing 71% of the total area of fen in the Fraser Lowland (Fig. 6). Surrey Bend and Douglas Island account for an additional 13% of the total fen area (Appendix D). Figure 11 shows that most fen areas are undisturbed.

Hardhack-dominated fens presented special difficulties for access during field checking; therefore, some wetlands classified as fens may also contain bogs. Subsequent detailed vegetation surveys show that Surrey Bend is such an area.

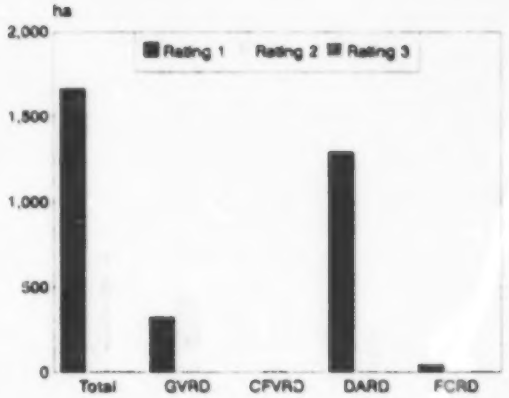


Figure 11. Fen Ratings

Gravel Bar

This category was created specifically for the purpose of this project; gravel bars are not accommodated within the CWCS (see Wetland Classification for further discussion). Vegetation includes Black Cottonwood at all stages of succession as well as Willow and Alder. The level of succession (early, mid or late) specified in the data report pertains to the stage of vegetation succession of the entire gravel bar, even though it may contain vegetation at all three levels of succession.

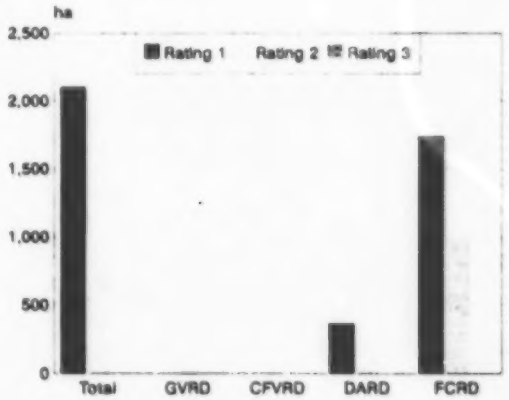


Figure 12. Gravel Bar Ratings

Gravel bars are located in the main Fraser River channel between Laidlaw (at the extreme eastern end of the study area) and the mouth of the Sumas River. The apparent registration problems of these wetland units demonstrates that these formations change radically from time to time due to the peak discharge or freshet of the Fraser River. The base map detail for this area was taken from 1976 air photos; this wetland inventory used 1986 air photos, by which time many of the gravel bars had changed substantially.

The majority of gravel bars are relatively undisturbed as seen in Figure 12. Bars of late succession account for 44% of the total; mid succession accounts for 39%; early succession bars are 12% of the total. Roughly 5% of all gravel bars occur as a portion of other large wetland units such as the Chehalis River delta and Capilano River mouth.

GIS Application

Every effort was made, while producing the maps in this report, to ensure the registration of thematic information to the base map in the GIS. The georeferencing methods used resulted in good registration in most cases. In some instances, they were less successful due to the meticulous precision demanded by computers and the cartographic licence used in traditional mapping as seen in the National Topographic System maps. For example, cultural features sometimes incorrectly appear to cut through a wetland unit. In traditional mapping, some exaggeration of cultural features is required when they are located near natural features; a road may closely parallel a shoreline on the ground, but in order to maintain the separation on a map it may be necessary to represent that road shifted from its actual position. The digital NTS base maps reflect this representational position, whereas the wetland units derived from air photos reflect the true position.

It is expected that as standardized digital databases become more readily available, problems such as these will become less pronounced. This should aid in the recognition and promotion of GIS as another valuable tool in resource management.

RECOMMENDATIONS

Although this inventory is an important step in understanding the distribution and abundance of wetlands in this region, it is only the first step. Further work needs to be done on wetland evaluation. The rating system used in this report was based on personal judgement about visible human disturbance, observed during field inspections. If priorities need to be applied to specific wetlands for acquisition or protection purposes, then a more detailed evaluation system should be devised which would include other measures of wetland health and importance.

As an adjunct to this evaluation system, it would be important to know how much of the wetland area is protected or under some form of land-use control and how much is unprotected. Due to the complexity of this matter, it was not possible to collect enough of this information in time for this report. Therefore, a separate study should be done to analyze the land status pertaining to wetlands in the Fraser Lowland.

Because of the important contribution eelgrass makes to the productivity of the estuary, further studies should be undertaken to determine the exact extent of the beds and the density of cover. An interagency group with various resource interests in the Boundary Bay, delta foreshore area has just been formed; an in-depth eelgrass study will be part of their effort.

The use of geographic information systems in future studies should be considered a good investment of time and resources. The GIS database created for this wetlands inventory has laid a sound foundation upon which future studies can build and expand. A standardized approach

using GIS would result in the more timely and meaningful delivery of information critical to effective resource management.

Finally, there is also a need for improved public awareness about wetlands in the Fraser Lowland. Since this report is aimed at resource managers and interested environmental groups, an additional information package for landowners of wetland sites as well as the general public should be considered.

APPENDIX A - WETLAND CLASS SIZE (HA) BY MUNICIPALITY AND RATING

MUNICIPALITY	Rating	Marsh	Shallow Water	Swamp	Bog	Fen	Gravel Bar	Total
Central Fraser Valley Regional District		**154.1**	**429.9**	**53.4**	**17.4**	**26.6**		**681.4**
Abbotsford District		**74.1**	**248.9**					**323.0**
	2	71.0	211.7					282.7
	3	3.1	37.2					40.3
CFVRD Ea A		**1.3**	**25.8**			**26.6**		**53.7**
	2	1.3	25.8			26.6		53.7
Matsqui District		**78.7**	**155.2**	**53.4**	**17.4**			**304.7**
	1	3.0	0.3					3.3
	2	73.2	120.0	53.4	6.8			253.4
	3	2.5	34.9		10.6			48.0
Dewdney-Alouette Regional District		**1284.1**	**1773.1**	**602.3**	**196.3**	**1535.7**	**374.2**	**5765.7**
DARD Ea A		**418.1**	**493.4**		**196.3**	**1177.6**		**2285.4**
	1	392.8	438.3		196.3	1177.6		2205.0
	2	25.3	55.1					80.4
DARD Ea B/C/D/E		**489.9**	**929.5**	**247.1**		**4.4**	**374.2**	**2045.1**
	1	123.0	50.9			4.4	364.1	542.4
	2	350.2	849.5	247.1			10.1	1456.9
	3	16.7	29.1					45.8
Maple Ridge District		**58.7**	**61.7**	**41.2**		**144.3**		**305.9**
	1	47.3	13.0	37.7				98.0
	2	11.3	47.4	3.5		144.3		206.5
	3	0.1	1.3					1.4
Mission District		**244.0**	**125.8**	**282.4**				**652.2**
	1	31.1	15.5	263.9				310.5
	2	206.2	107.9					314.1
	3	6.7	2.4	18.5				27.6
Pitt Meadows District		**73.4**	**162.7**	**31.6**		**209.4**		**477.1**
	1	20.1	22.5	3.9		111.5		158.0
	2	53.3	138.8	20.2		97.9		310.2
	3		1.4	7.5				8.9

Fraser-Cheam Regional District		**732.0**	**1481.5**	**52.7**		**52.1**	**2730.0**	**5048.3**
Chilliwack District		**251.9**	**663.6**	**52.4**		**45.3**	**1015.7**	**2028.9**
	1	79.5	59.4			45.3	470.6	654.8
	2	156.5	549.9	52.4			545.1	1303.9
	3	15.9	54.3					70.2
FCRD Ea C/D/E/F		**320.1**	**398.5**	**0.3**			**748.0**	**1466.9**
	1	293.3	276.6				358.4	928.3
	2	26.8	121.9	0.3			389.6	538.6
Harrison Hot Springs Village		**5.9**	**24.6**			**6.8**		**37.3**
	2	5.9	23.8					29.7
	3		0.8			6.8		7.6
Kent District		**154.1**	**394.8**				**966.3**	**1515.2**
	1	29.8	233.3				911.4	1174.5
	2	123.9	160.6				54.9	339.4
	3	0.4	0.9					1.3
Greater Vancouver Regional District		**3941.5**	**23296.6**	**728.7**	**1668.8**	**757.0**	**18.1**	**30410.7**
Burnaby District		**45.0**	**85.0**	**31.4**	**11.0**			**172.4**
	1	0.2	2.2					2.4
	2	38.8	69.2	12.7	5.5			126.2
	3	6.0	13.6	18.7	5.5			43.8
Coquitlam District		**306.1**	**118.4**	**27.5**	**2.3**	**169.4**		**623.7**
	1	290.7	106.8	23.9	2.3	169.4		593.1
	2	14.4	6.2					20.6
	3	1.0	5.4	3.6				10.0
Delta District		**1459.3**	**13751.4**	**69.2**	**1496.7**	**28.3**		**16804.9**
	1	1327.5	12570.8	53.1		28.3		13979.7
	2	130.1	998.1	14.3				1142.5
	3	1.7	182.5	1.8	1496.7			1682.7
GVRD Ea A/B		**925.3**	**4905.5**	**49.7**	**0.3**	**132.0**		**6012.8**
	1	902.2	4361.8	39.3		132.0		5435.3
	2	5.7	287.2	10.4	0.3			303.6
	3	17.4	256.5					273.9
Langley City		**0.7**	**4.5**					**5.2**
	2	0.7	4.5					5.2
Langley District		**97.8**	**158.4**	**142.0**	**83.2**	**111.8**		**593.2**
	1	14.6	2.0			6.6		23.2
	2	83.2	156.4	142.0	28.7	105.2		515.5
	3				54.5			54.5

New Westminster City		**3.6**	**28.3**	**12.8**				**44.7**
	1	1.0	2.5	12.2				15.7
	2		15.8	0.6				16.4
	3	2.6	10.0					12.6
North Vancouver City		**1.9**	**4.1**					**6.0**
	3	1.9	4.1					6.0
North Vancouver District		**5.9**	**96.0**				**5.8**	**107.7**
	2	5.9	91.4				2.7	100.0
	3		4.6				3.1	7.7
Port Coquitlam City		**40.7**	**48.2**	**27.8**	**4.6**	**18.4**		**139.7**
	1	23.0	20.5	27.8	4.6	18.4		94.3
	2	17.7	27.7					45.4
Port Moody City		**6.3**	**100.0**					**106.3**
	2	2.8	85.0					87.8
	3	3.5	15.0					18.5
Richmond City		**832.3**	**2156.5**	**50.7**	**70.7**			**3110.2**
	1	800.3	2083.4	40.5				2924.2
	2	19.8	37.5	5.0	47.8			110.1
	3	12.2	35.6	5.2	22.9			75.9
Surrey District		**128.3**	**1539.6**	**308.2**		**297.1**		**2273.2**
	1	19.9	677.8					697.7
	2	107.4	839.3	304.6		297.1		1548.4
	3	1.0	22.5	3.6				27.1
Vancouver City		**82.4**	**181.8**	**1.3**				**265.5**
	1	75.1	72.9					148.0
	2	4.8	86.1	0.6				91.5
	3	2.5	22.8	0.7				26.0
West Vancouver District		**5.9**	**14.9**	**8.1**			**12.3**	**41.2**
	2	5.9	14.9	8.1			12.3	41.2
White Rock City			**104.0**					**104.0**
	2		104.0					104.0
Total Study Area		**6111.7**	**26981.1**	**1437.1**	**1882.5**	**2371.4**	**3122.3**	**41906.1**
	1	4474.4	21010.5	502.3	203.2	1693.5	2104.5	29988.4
	2	1542.1	5235.7	875.2	89.1	671.1	1014.7	9427.9
	3	95.2	734.9	59.6	1590.2	6.8	3.1	2489.8

APPENDIX B - REGIONAL DISTRICT SUMMARY OF WETLAND CLASS SIZE (HA) BY RATING

		CLASS						
	RATING	Marsh	Shallow Water	Swamp	Bog	Fen	Gravel Bar	Total
Central Fraser Valley Regional District		**154.1**	**429.9**	**53.4**	**17.4**	**26.6**	**0.0**	**681.4**
	1	3.0	0.3	0.0	0.0	0.0	0.0	3.3
	2	145.5	357.5	53.4	6.8	26.6	0.0	589.8
	3	5.6	72.1	0.0	10.6	0.0	0.0	88.3
Dewdney-Alouette Regional District		**1284.1**	**1773.1**	**602.3**	**196.3**	**1535.7**	**374.2**	**5765.7**
	1	614.3	540.2	305.5	196.3	1293.5	364.1	3313.9
	2	646.3	1198.7	270.8	0.0	242.2	10.1	2368.1
	3	23.5	34.2	26.0	0.0	0.0	0.0	83.7
Fraser-Cheam Regional District		**732.0**	**1481.5**	**52.7**	**0.0**	**52.1**	**2730.0**	**5048.3**
	1	402.6	569.3	0.0	0.0	45.3	1740.4	2757.6
	2	313.1	856.2	52.7	0.0	0.0	989.6	2211.6
	3	16.3	56.0	0.0	0.0	6.8	0.0	79.1
Greater Vancouver Regional District		**3941.5**	**23296.6**	**713.6**	**1668.8**	**757.0**	**18.1**	**30410.7**
	1	3454.5	19900.7	196.8	6.9	354.7	0.0	23913.6
	2	437.2	2823.3	498.3	82.3	402.3	15.0	4258.4
	3	49.8	572.6	33.6	1579.6	0.0	3.1	2238.7
Total Study Area		**6111.7**	**26981.1**	**1437.1**	**1882.5**	**2371.4**	**3122.3**	**41906.1**
	1	4474.4	21010.5	502.3	203.2	1693.5	2104.5	29988.4
	2	1542.1	5235.7	875.2	89.1	671.1	1014.7	9427.9
	3	95.2	734.9	59.6	1590.2	6.8	3.1	2489.8

APPENDIX C - WETLAND AREA (HA) BY RATING AND MUNICIPALITY

MUNICIPALITY	RATING 1 AREA	1 NO	2 AREA	2 NO	3 AREA	3 NO	TOTAL AREA	TOTAL NO
Central Fraser Valley Regional District	**3.3**	**1**	**589.7**	**18**	**88.3**	**4**	**681.3**	**23**
Abbotsford District			282.7	5	40.3	2	323.0	7
CFVRD Ea A			53.7	2			53.7	2
Matsqui District	3.3	1	253.3	11	48.0	2	304.6	14
Deudney-Alouette Regional District	**3314.0**	**35**	**2367.7**	**47**	**83.7**	**8**	**5765.4**	**90**
DARD Ea A	2205.0	4	80.4	3			2285.4	7
DARD Ea B/C/D/E	542.4	24	1456.6	28	45.8	4	2044.8	56
Maple Ridge District	98.0	2	206.5	3	1.4	1	305.9	6
Mission District	310.5	1	314.1	5	27.6	2	652.2	8
Pitt Meadows District	158.1	4	310.1	8	8.9	1	477.1	13
Fraser-Cheam Regional District	**2757.3**	**76**	**2211.1**	**42**	**79.1**	**6**	**5047.5**	**124**
Chilliwack District	654.8	26	1303.8	12	70.2	4	2028.8	42
FCRD Ea C/D/E/F	928.0	19	538.5	12			1466.5	31
Harrison Hot Springs Village			29.7	1	7.6	1	37.3	2
Kent District	1174.5	31	339.1	17	1.3	1	1514.9	49
Greater Vancouver Regional District	**23913.3**	**51**	**4259.7**	**81**	**2238.4**	**44**	**30411.4**	**176**
Burnaby District	2.4	1	126.3	3	43.8	6	172.5	10
Coquitlam District	593.1	9	20.6	1	9.9	3	623.6	13
Delta District	13979.6	16	1143.6	11	1682.7	6	16805.9[3]	33
GVRD Ea A/B	5435.3	6	303.6	6	273.9	1	6012.8	13
Langley City			5.2	2			5.2	2
Langley District	23.2	3	515.4	21	54.5	2	593.1	26
New Westminster City	15.6	1	16.4	1	12.5	5	44.5	7
North Vancouver City					5.9	2	5.9	2
North Vancouver District			100.0	2	7.7	1	107.7	3
Port Coquitlam City	94.5	2	45.4	2			139.9	4
Port Moody City			87.8	2	18.6	1	106.4	3
Richmond City	2923.9	11	110.2	8	75.8	8	3109.9	27
Surrey District	697.7	1	1548.4	15	27.0	6	2273.1	22
Vancouver City	148.0	1	91.5	3	26.1	3	265.6	7
West Vancouver District			41.3	3			41.3	3
White Rock City			104.0	1			104.0	1
TOTALS	29987.9	163[1]	9428.2	188	2489.5	62	41905.6	413[2]

[1] Nearly half (80) of these wetland units are gravel bars; they account for 11 % of wetland area with a '1' rating.

[2] Fifteen wetland units straddle municipal boundaries; the total number of wetland units is 398.

[3] Foreshore tidal flats and Burns Bog account for this large number.

APPENDIX D - LOCATION AND SIZE (ha) OF WETLAND UNITS BY WETLAND CLASS

WETLAND UNIT NO.	LOCATION	BOG
100	Burns Bog	1496.7
135	Pitt Polder	196.3
49	Richmond Nature Park	47.8
154	Derby Reach Regional Park	30.7
189	Glen Valley	28.7
153	Fort Langley, northwest of	23.8
84	Lulu Island southeast	22.9
208	Laxton Lake	10.6
108	Coquitlam River, lower reach	6.9
209	Judson Lake	6.8
19	Deer Lake	5.5
18	Burnaby Lake and Still Creek	5.5
35	Camosun Bog, UBC Endowment Land	0.3
		1882.5

WETLAND UNIT NO.	LOCATION	FEN
135	Pitt Polder	1177.6
125	North Alouette River, adjacent	213.3
113	Surrey Bend	177.3
132	Addington Point Marsh	160.2
111	Douglas Island	132.0
171	Nicomekl River, north bank	112.0
124	Cod Island	111.5
178	Campbell River, upper reach	92.1
286	Sumas River mouth	45.3
149	Katzie Slough upper reaches	28.9
67	Alaksen National Wildlife Area	28.3
108	Coquitlam River, lower reach	27.6
216	Wades Creek	26.6
177	Nicomekl River, headwaters	13.1
168	Serpentine Wildlife Management	7.8
398	Miami Creek area	6.8
184	West Creek	6.6
384	Lake Errock	4.4
		2371.4

WETLAND UNIT NO.	LOCATION	MARSH
22	Westham Island foreshore	746.2
139	Widgeon Creek Valley	576.6
21	Lulu Island foreshore	479.7
75	South Arm Marshes	448.5
135	Pitt Polder	294.4
23	Brunswick Point	197.7
212	Hatzic Lake	166.0
142	Pitt Lake delta	163.5
27	Boundary Bay	150.5
392	Chehalis River delta	147.6
20	Sea and Iona Islands foreshore	126.3
221	Norrish Creek delta	117.0
74	Ladner Marsh	115.2
396	Morris and Weaver Creeks	109.9
220	Nicomen Slough	96.0
24	Roberts Bank interjetty area	83.1
287	McGillivray Creek Wildlife Sanc	79.5
34	Musqueam Marsh	75.1
193	Stave Lake, southeast	72.3
168	Serpentine Wildlife Management	54.4
192	Stave Lake, northwest	52.2
156	Kanaka Creek	47.1
133	Addington Marsh foreshore	47.0
280	Lakemount Marsh	44.5
254	Chilliwack and Atchelitz Creeks	43.4
43	Swishwash Island	41.8
178	Campbell River, upper reach	39.5
196	Silverdale Creek	39.2
18	Burnaby Lake and Still Creek	38.7
123	Alouette and North Alouette Riv	34.7
108	Coquitlam River, lower reach	34.5
332	Cheam Lake, Popkum	34.4
190	Crescent Island	34.2
38	McDonald Slough	31.3
198	Matsqui Island	31.1
138	Pitt Polder foreshore north	30.1
26	Centennial Beach	28.8
67	Alaksen National Wildlife Area	28.3
308	Camp and Gravel Sloughs	27.2
131	Minnekhada Regional Park	26.3
252	Hope Slough	25.9
113	Surrey Bend	25.3
219	Strawberry Island	24.3
128	Chatham Flats, Pitt River	24.2
356	Maria Slough, middle reach	21.1
290	Vedder Canal Marsh	21.0
271	Wilson Slough	20.5
28	Mud Bay	19.9
391	Bateson and Duncan Sloughs	19.8
327	Cheam and Agassiz sloughs	19.8
129	Pitt River, Alouette River to Sn	19.6
202	Matsqui Slough	18.4
137	Pitt Polder foreshore south	17.8
32	Musqueam Flats	17.4
61	Steveston Island	17.2
357	Maria Slough, middle reach	16.1
213	Chilqua Slough	15.2
289	Vedder Canal	14.8
122	Pitt River, RR bridge to Alouete	14.8
31	Campbell River mouth	14.8
126	DeBoville Slough	14.4
159	McMillan Island, near Fort Lang	14.3
134	Sturgeon Slough	14.3
44	Middle Arm south shore	14.0

64	Harlock and Albion Islands	13.7
65	Westham Island east	13.3
349	Fraser River, east of Herring	13.2
284	Lonzo Creek	12.4
315	Mountain Slough	12.3
393	Harrison River, east bank	12.1
240	Queens Island Slough	11.9
121	Pitt River, RR bridge to De Bovl	11.5
239	Zaitscullachan Slough	11.2
85	Tilbury Island central	11.2
385	Harrison Bay, western shore	11.1
233	Nicomen Slough side channel	10.9
119	Pitt River mouth east	10.7
229	Nicomen Island central	9.9
179	Aldergrove, south of	9.9
358	Maria Slough, upper reach	9.2
82	Tilbury Island west	8.6
222	Mud Slough, Nicomen Island	8.5
83	Tilbury Slough	8.5
200	McLennan Creek/Gifford Slough	8.3
158	McMillan Island (at ferry termi	8.3
89	Don and Lion Islands	8.3
72	Canoe Pass northeast	8.2
285	Sumas River, upper reaches	8.0
42	Sea Island south	7.6
381	Johnsons Slough	7.4
66	Canoe Pass north shore	7.4
79	Deas Island east	7.1
76	Gilmour Island	7.0
197	Mandale Slough	6.6
297	Nelson and Bell sloughs	6.4
279	Sumas River	6.4
205	Page Lake	6.4
167	Serpentine River, lower reach	6.3
185	Palmateer Creek	6.2
130	Pitt River, Sheridan Hill fores	6.2
117	Pitt River mouth west	6.2
397	Miami Creek	5.9
11	Maplewood Flats	5.9
95	Purfleet Point, Annacis Island	5.8
78	Deas Island west	5.8
231	Nicomen Island south central	5.7
292	Yarrow	5.6
36	Iona Island north	5.6
19	Deer Lake	5.5
383	Harrison River mouth	5.0
371	Peters Indian Reserve	5.0
141	Pitt Lake south shore	4.8
353	Maria Slough, Seabird Island	4.6
146	Mann Point, Barnston Island	4.6
46	Bridgepoint to No. 8 Road	4.6
348	Fraser River, east of Maria Slo	4.5
203	Matsqui Slough, northern tribut	4.5
389	Harrison River south shore	4.4
166	Nicomekl River, lower reach	4.4
96	Annacis Island north	4.4
227	Nicomen Island north central	4.3
40	Sea Island north	4.3
224	Nicomen Island north central	4.2
41	Sea Island southeast	4.2
333	Fraser River south shore, Popku	3.8
251	Shefford Slough	3.8
183	Aldergrove	3.8
163	Salmon River, Fort Langley	3.8
68	Robertson and London Sloughs	3.8
355	Maria Slough tributary	3.6
211	Neilson Regional Park	3.6
3	Beaver Lake, Stanley Park	3.6
16	Port Moody, Pacific Coast Termi	3.5
90	Sunbury	3.3
63	Gilbert Beach	3.3
120	Katzie Slough	3.2
88	Annacis Channel north shore	3.2
87	Gravesend Reach	3.2
6	First Narrows, north shore	3.2
354	Maria Slough, middle reach	3.1
195	Hanna Creek	3.0
261	Nicomen Island slough	2.9
186	Fraser River south shore	2.9
140	Grant Narrows north shore	2.9
17	Port Moody foreshore	2.8
382	Harrison River mouth	2.7
223	Nicomen Slough, north shore	2.7
5	Capilano River mouth	2.7
234	Nicomen Slough, north of	2.6
182	CFB Aldergrove	2.6
33	North Arm Jetty	2.6
210	Hatzic Slough System	2.5
204	Clayburn Creek	2.5
230	Nicomen Island central	2.4
94	Annacis Channel north shore	2.4
330	Ferry Island slough	2.3
237	Quaamitch Slough	2.3
288	Millar/McGillivray Sloughs	2.2
111	Douglas Island	2.2
326	Fraser River, west of Agassiz B	2.1
228	Nicomen Island central	2.1
56	Tree Island area	2.1
243	Fraser River north bank	2.0
214	Chilqua Slough, north of	1.9
86	Tilbury Island east	1.9
352	Maria Slough, west bank	1.8
281	Sumas Lake Canal	1.8
62	Cannery Row, Steveston	1.8
7	McKay Creek mouth	1.8
232	Nicomen Island north central	1.7
390	Bateson and Duncan Slough area	1.6
344	Fraser River, east of Popkum	1.6
241	Queens Island	1.6
188	Nathan Slough	1.6
187	Nathan Canal	1.6
47	Mitchell Island	1.6
238	Yaalstrik Island Slough	1.4
387	Harrison Bay	1.3
314	Formerly part of Mountain Sloug	1.3
282	Sumas River (old scar)	1.3
235	Nicomen Slough north bank	1.3
127	Pitt River, De Boville Slough tn	1.3
201	Fraser River, south shore	1.2
81	Deas Slough south shore	1.2
48	Arthur Laing Bridge to Boundary	1.2
37	Southlands	1.2

25	Tsawwassen Beach	1.2
226	Nicomen Island north central	1.1
215	Hatzic Lake, southeast of	1.1
170	Nicomekl River, middle reach	1.1
116	Pitt Meadows Fraser foreshore	1.1
360	Fraser River, north of Herrling	1.0
283	Sumas River, former tributary	1.0
225	Nicomen Island north central	1.0
152	Derby Reach west	1.0
58	Poplar Island	1.0
395	Chehalis Indian River No.6	0.9
295	Sweltzer Creek	0.9
2	Lost Lagoon, Stanley Park	0.9
177	Nicomekl River, headwaters	0.8
80	Green Slough	0.8
69	Tamboline Slough, Westham Island	0.8
253	Coco-oppelo Slough north end	0.7
236	Nicomen Slough north bank	0.7
173	Nicomekl River, middle reach	0.7
93	Fraser Surrey Docks	0.7
60	Garry Point	0.7
54	No. 8 Road to CN Bridge	0.7
45	Middle Arm southeast shore	0.7
39	Marpole	0.7
176	Nicomekl River, upper reach	0.6
162	Fort Langley, southwest of	0.6
107	Queens Reach north shore	0.6
92	North Delta foreshore	0.6
71	Canoe Pass south shore	0.6
291	Lewis Slough	0.5
118	Pitt River mouth flats	0.5
109	Tree Island	0.5
97	Annacis Island south	0.5
329	Ferry Island slough, south shor	0.4
328	Agassiz slough, southeast of	0.4
161	Fort Langley, nw of 88th. Avenu	0.4
105	Fraser Mills	0.4
296	Sardis Park	0.3
157	Derby Reach Regional Park, sout	0.3
55	Burnaby Big Bend foreshore	0.3
298	Harrison River mouth	0.2
206	Pond northwest of Clearbrook	0.2
191	Stave Lake, sw of	0.2
165	Trinity Western University	0.2
114	Fraser Glen House	0.2
101	Brownsville	0.2
98	Annacis Island northeast	0.2
91	City Reach	0.2
73	Port Guichon	0.2
70	Westham Island slough	0.2
13	Barnett Marine Park	0.2
351	Maria Slough, adjacent to	0.1
307	Windermere Island	0.1
194	Chester Creek mouth	0.1
175	Nicomekl River, upper reach	0.1
174	Nicomekl River, middle reach	0.1
150	Derby Reach west	0.1
148	Bishops Reach	0.1
145	Barnston Island north	0.1
144	Barnston Island south	0.1
106	Queens Reach south shore	0.1
103	Sapperton Flats	0.1
59	Queensborough	0.1
57	New Westminster border to RR Br	0.1
50	East of Boundary Road	0.1
14	Port Moody, south shore	0.1
12	Burrard Inlet east, south shore	0.1
8	Mosquito Creek mouth	0.1
77		
		=======
		6111.7

WETLAND UNIT NO.	LOCATION	GRAVEL
245	Fraser River, at Harrison R.	433.6
359	Fraser River, east of Seabird I	166.8
313	Fraser River, near Mountain Slo	158.4
350	Fraser River, nw of Herrling I.	151.6
392	Chehalis River delta	143.3
312	Greyell Slough/Island	117.7
293	Vedder River	104.7
277	Fraser R., near Nicomen Island	94.2
367	Fraser River, near Seabird Isla	93.9
336	Fraser River, east of Agassiz B	90.6
259	Fraser River, near Chilliwack C	84.7
370	Fraser River, near Peters IR	80.1
347	Fraser River, Maria Slough mout	79.8
337	Herrling Island	77.9
257	Fraser River, near Chilliwack C	76.3
247	Fraser River, near Queens Islan	68.4
375	Fraser River, west of Laidlaw	63.3
341	Fraser River, Maria Slough mout	60.0
316	Fraser River, near Mountain Slo	58.6
331	Fraser River at Agassiz Bridge	54.9
394	Chehalis River, lower reach	46.7
310	Fraser River, near Mountain Slo	46.6
306	Fraser River, near Nelson Sloug	38.2
263	Yaalstrick Island	37.1
378	Fraser River, west of Laidlaw	37.0
267	Yaalstrick Island west	35.5
369	Peters Indian Reserve	32.5
372	Fraser River, near Laidlaw	31.1
273	Fraser River, near Yaalstrick I	27.9
325	Fraser River, west of Agassiz B	26.8
319	Fraser River, near Greyell Slou	26.2
300	Fraser River, Harrison R. mouth	26.0
246	Fraser River, near Queens Islan	24.6
317	Fraser River, near Greyell Slou	23.8
321	Fraser River, near Cheam Slough	21.2
339	Fraser River, west of Maria Slo	18.2
258	Fraser River, Chilliwack Ck. mo	16.7
335	Fraser River, east of Agassiz B	15.3
368	Fraser River, near Peters IR	14.8
346	Fraser River, south of Herrling	14.5
248	Fraser River, near Queens Islan	14.2
373	Fraser River, southwest of Laid	13.4

304	Fraser River, near Nelson Sloug	12.3
5	Capilano River mouth	12.3
260	Fraser River, near Yaalstrick I	12.2
322	Fraser River, west of Agassiz B	10.9
305	Fraser River, near Nelson Sloug	10.2
278	Fraser R., near Nicomen Island	10.1
262	Yaalstrick Island	10.1
365	Fraser River, north of Herrling	9.2
324	Fraser River, west of Agassiz B	8.9
318	Fraser River, near Greyell Slou	8.6
266	Fraser R., near Chilliwack Moun	7.3
342	Fraser River, east of Herrling	7.0
271	Wilson Slough	6.8
377	Fraser River, west of Laidlaw	6.5
276	Fraser R., near Chilliwack Moun	6.0
250	Fraser River, near Chilliwack C	6.0
244	Fraser River, west of Harrison	5.7
309	Fraser River, near Mountain Slo	5.5
323	Fraser River, near Cheam Slough	5.4
256	Fraser River, Nicomen Island ea	5.2
366	Fraser River, north of Herrling	5.1
374	Fraser River, southwest of Laid	5.0
311	Fraser River, near Greyell Slou	5.0
343	Fraser River, se of Herrling I.	4.9
218	Fraser River, near Hatzic River	4.7
320	Fraser River, near Cheam Slough	4.5
242	Queens Island south shore	4.4
340	Fraser River, west of Maria Slo	4.2
299	Fraser River, Harrison R. mouth	4.1
268	Fraser R., near Chilliwack Moun	3.5
379	Johnsons Slough mouth	3.3
10	Seymour River, lower reach	3.1
301	Fraser River, near Nelson Sloug	3.0
338	Fraser River, west of Maria Slo	2.8
9	Lynn Creek mouth	2.7
362	Fraser River, north of Herrling	2.5
345	Fraser River, east of Popkum	2.4
249	Fraser River, near Chilliwack	2.3
376	Fraser River, west of Laidlaw	2.2
361	Fraser River, north of Herrling	2.2
295	Sweltzer Creek	1.9
269	Fraser R., near Chilliwack Moun	1.9
302	Fraser River, near Nelson Sloug	1.6
275	Fraser R., near Chilliwack Moun	1.5
272	Fraser River, near Yaalstrick I	1.5
363	Fraser River, north of Herrling	1.3
334	Fraser River, east of Agassiz B	1.3
380	Johnsons Slough mouth	1.2
264	Fraser River, near Yaalstrick I	1.0
387	Harrison Bay	0.8
303	Fraser River, near Nelson Sloug	0.8
255	Fraser River, Nicomen Island ea	0.8
265	Fraser R., near Chilliwack Moun	0.5
		3122.7

WETLAND UNIT NO.	LOCATION	SHALLOW WATER
27	Boundary Bay	5161.6
22	Westham Island foreshore	4311.8
21	Lulu Island foreshore	3473.6
23	Brunswick Point	2630.2
20	Sea and Iona Islands foreshore	2436.7
24	Roberts Bank interjetty area	953.9
28	Mud Bay	677.8
142	Pitt Lake delta	381.6
386	Harrison Bay	364.0
1	Spanish Banks	345.7
29	Crescent Beach	327.4
30	Semiahmoo Bay/Ocean Park	318.0
25	Tsawwassen Beach	296.8
135	Pitt Polder	294.4
220	Nicomen Slough	288.0
32	Musqueam Flats	256.5
100	Burns Bog	166.3
139	Widgeon Creek Valley	144.1
392	Chehalis River delta	143.3
123	Alouette and North Alouette Riv	138.6
279	Sumas River	122.0
396	Morris and Weaver Creeks	109.9
393	Harrison River, east bank	109.3
293	Vedder River	104.7
252	Hope Slough	103.4
254	Chilliwack and Atchelitz Creeks	101.2
75	South Arm Marshes	89.9
11	Maplewood Flats	88.7
166	Nicomekl River, lower reach	83.7
17	Port Moody foreshore	83.6
192	Stave Lake, northwest	78.4
34	Musqueam Marsh	72.9
285	Sumas River, upper reaches	72.4
212	Hatzic Lake	71.2
18	Burnaby Lake and Still Creek	66.4
181	Pepin Creek	65.7
308	Camp and Gravel Sloughs	63.4
297	Nelson and Bell sloughs	57.7
167	Serpentine River, lower reach	56.6
67	Alaksen National Wildlife Area	56.6
178	Campbell River, upper reach	52.6
337	Herrling Island	52.0
245	Fraser River, at Harrison R.	48.2
169	Serpentine River, middle reach	47.0
289	Vedder Canal	44.4
172	Serpentine River, upper reach	39.9
350	Fraser River, nw of Herrling I.	37.9
315	Mountain Slough	37.0
163	Salmon River, Fort Langley	34.5
281	Sumas Lake Canal	34.3
251	Shefford Slough	34.2
134	Sturgeon Slough	33.5
103	Sapperton Flats	32.6
357	Maria Slough, middle reach	29.9

327	Cheam and Agassiz sloughs	29.6
120	Katzie Slough	28.8
313	Fraser River, near Mountain Slo	27.9
108	Coquitlam River, lower reach	27.6
239	Zaitscullachan Slough	26.0
208	Laxton Lake	24.7
219	Strawberry Island	24.3
280	Lakemount Marsh	24.0
397	Miami Creek	23.8
367	Fraser River, near Seabird Isla	23.5
277	Fraser R., near Nicomen Island	23.5
121	Pitt River, RR bridge to De Bovl	23.3
213	Chilqua Slough	22.9
381	Johnsons Slough	22.2
82	Tilbury Island west	21.8
170	Nicomekl River, middle reach	21.4
356	Maria Slough, middle reach	21.1
237	Quaamitch Slough	20.4
43	Swishwash Island	19.8
288	Millar/McGillivray Sloughs	19.4
207	Mill Lake, Clearbrook	19.4
141	Pitt Lake south shore	19.0
66	Canoe Pass north shore	18.6
359	Fraser River, east of Seabird I	18.5
202	Matsqui Slough	18.4
240	Queens Island Slough	17.9
131	Minnekhada Regional Park	17.5
2	Lost Lagoon, Stanley Park	17.5
358	Maria Slough, upper reach	17.1
137	Pitt Polder foreshore south	15.7
198	Matsqui Island	15.5
168	Serpentine Wildlife Management	15.5
61	Steveston Island	15.1
16	Port Moody, Pacific Coast Termi	15.0
129	Pitt River, Alouette River to Sn	14.3
95	Purfleet Point, Annacis Island	13.7
96	Annacis Island north	13.3
349	Fraser River, east of Herrling	13.2
312	Greyell Slough/Island	13.1
238	Yaalstrik Island Slough	12.9
173	Nicomekl River, middle reach	12.9
74	Ladner Marsh	12.4
5	Capilano River mouth	12.3
64	Harlock and Albion Islands	11.6
128	Chatham Flats, Pitt River	11.1
36	Iona Island north	11.1
87	Gravesend Reach	10.8
86	Tilbury Island east	10.8
138	Pitt Polder foreshore north	10.3
204	Clayburn Creek	10.2
210	Hatzic Slough System	9.8
152	Derby Reach west	9.8
89	Don and Lion Islands	9.8
85	Tilbury Island central	9.5
283	Sumas River, former tributary	9.4
259	Fraser River, near Chilliwack C	9.4
156	Kanaka Creek	9.4
133	Addington Marsh foreshore	9.1
330	Ferry Island slough	9.0
347	Fraser River, Maria Slough mout	8.9
287	McGillivray Creek Wildlife Sanc	8.8
65	Westham Island east	8.8
190	Crescent Island	8.6
46	Bridgepoint to No. 8 Road	8.6
257	Fraser River, near Chilliwack C	8.5
132	Addington Point Marsh	8.4
284	Lonzo Creek	8.3
200	McLennan Creek/Gifford Slough	8.3
47	Mitchell Island	8.2
193	Stave Lake, southeast	8.0
44	Middle Arm south shore	7.7
247	Fraser River, near Queens Islan	7.6
69	Tamboline Slough, Westham Islan	7.5
19	Deer Lake	7.4
294	Barrett Creek	7.2
101	Brownsville	7.0
68	Robertson and London Sloughs	7.0
40	Sea Island north	7.0
63	Gilbert Beach	6.9
271	Wilson Slough	6.8
209	Judson Lake	6.8
306	Fraser River, near Nelson Sloug	6.7
88	Annacis Channel north shore	6.7
300	Fraser River, Harrison R. mouth	6.5
111	Douglas Island	6.5
42	Sea Island south	6.5
33	North Arm Jetty	6.5
144	Barnston Island south	6.4
187	Nathan Canal	6.3
221	Norrish Creek delta	6.2
126	DeBoville Slough	6.2
331	Fraser River at Agassiz Bridge	6.1
253	Coco-oppelo Slough north end	6.1
246	Fraser River, near Queens Islan	6.1
236	Nicomen Slough north bank	6.1
145	Barnston Island north	6.1
124	Cod Island	5.9
92	North Delta foreshore	5.9
158	McMillan Island (at ferry termi	5.6
56	Tree Island area	5.6
38	McDonald Slough	5.4
314	Formerly part of Mountain Sloug	5.3
119	Pitt River mouth east	5.3
394	Chehalis River, lower reach	5.2
310	Fraser River, near Mountain Slo	5.2
90	Sunbury	5.2
179	Aldergrove, south of	5.0
106	Queens Reach south shore	5.0
391	Bateson and Duncan Sloughs	4.9
273	Fraser River, near Yaalstrick I	4.9
336	Fraser River, east of Agassiz B	4.8
291	Lewis Slough	4.8
55	Burnaby Big Bend foreshore	4.8
188	Nathan Slough	4.7
79	Deas Island east	4.7
339	Fraser River, west of Maria Slo	4.6
122	Pitt River, RR bridge to Alouete	4.6
10	Seymour River, lower reach	4.6
97	Annacis Island south	4.5
93	Fraser Surrey Docks	4.5
196	Silverdale Creek	4.4
148	Bishops Reach	4.4

117	Pitt River mouth west	4.4
107	Queens Reach north shore	4.4
48	Arthur Laing Bridge to Boundary	4.4
227	Nicomen Island north central	4.3
155	Derby Reach east	4.3
146	Mann Point, Barnston Island	4.3
94	Annacis Channel north shore	4.3
370	Fraser River, near Peters IR	4.2
182	CFB Aldergrove	4.0
332	Cheam Lake, Popkum	3.8
292	Yarrow	3.8
234	Nicomen Slough, north of	3.8
183	Aldergrove	3.8
91	City Reach	3.7
233	Nicomen Slough side channel	3.6
191	Stave Lake, sw of	3.6
3	Beaver Lake, Stanley Park	3.6
372	Fraser River, near Laidlaw	3.5
388	Harrison Bay	3.3
140	Grant Narrows north shore	3.2
109	Tree Island	3.2
77	Woodward Landing	3.2
62	Cannery Row, Steveston	3.2
316	Fraser River, near Mountain Slo	3.1
165	Trinity Western University	3.1
143	Parsons Channel	3.1
296	Sardis Park	3.0
54	No. 8 Road to CN Bridge	3.0
282	Sumas River (old scar)	2.9
261	Nicomen Island slough	2.9
217	Fraser River, north shore	2.8
205	Page Lake	2.8
14	Port Moody, south shore	2.8
382	Harrison River mouth	2.7
81	Deas Slough south shore	2.7
41	Sea Island southeast	2.7
9	Lynn Creek mouth	2.7
130	Pitt River, Sheridan Hill fores	2.6
31	Campbell River mouth	2.6
6	First Narrows, north shore	2.6
177	Nicomekl River, headwaters	2.5
83	Tilbury Slough	2.5
59	Queensborough	2.5
58	Poplar Island	2.5
321	Fraser River, near Cheam Slough	2.4
176	Nicomekl River, upper reach	2.4
127	Pitt River, De Boville Slough tn	2.4
290	Vedder Canal Marsh	2.3
116	Pitt Meadows Fraser foreshore	2.3
78	Deas Island west	2.3
8	Mosquito Creek mouth	2.3
151	Derby Reach east	2.2
13	Barnett Marine Park	2.2
371	Peters Indian Reserve	2.1
326	Fraser River, west of Agassiz B	2.1
222	Mud Slough, Nicomen Island	2.1
180	Bertrand Creek	2.1
175	Nicomekl River, upper reach	2.1
110	Essondale Islets	2.1
102	Sapperton	2.1
72	Canoe Pass northeast	2.1
112	Port Mann	2.0
70	Westham Island slough	2.0
378	Fraser River, west of Laidlaw	1.9
206	Pond northwest of Clearbrook	1.9
203	Matsqui Slough, northern tribut	1.9
298	Harrison River mouth	1.8
37	Southlands	1.8
7	McKay Creek mouth	1.8
335	Fraser River, east of Agassiz B	1.7
343	Fraser River, se of Herrling I.	1.6
241	Queens Island	1.6
39	Marpole	1.6
45	Middle Arm southeast shore	1.5
309	Fraser River, near Mountain Slo	1.4
304	Fraser River, near Nelson Sloug	1.4
286	Sumas River mouth	1.4
225	Nicomen Island north central	1.4
216	Wades Creek	1.4
157	Derby Reach Regional Park, sout	1.4
147	Pitt Meadows Airport foreshore	1.4
104	Sapperton Dyke	1.4
15	Port Moody, Reed Point	1.4
197	Mandale Slough	1.3
162	Fort Langley, southwest of	1.3
150	Derby Reach west	1.3
201	Fraser River, south shore	1.2
118	Pitt River mouth flats	1.2
353	Maria Slough, Seabird Island	1.1
348	Fraser River, east of Maria Slo	1.1
232	Nicomen Island north central	1.1
215	Hatzic Lake, southeast of	1.1
194	Chester Creek mouth	1.1
115	Pitt Meadows Fraser foreshore	1.1
80	Green Slough	1.1
73	Port Guichon	1.1
50	East of Boundary Road	1.1
360	Fraser River, north of Herrling	1.0
351	Maria Slough, adjacent to	1.0
324	Fraser River, west of Agassiz B	1.0
174	Nicomekl River, middle reach	1.0
98	Annacis Island northeast	1.0
57	New Westminster border to RR Br	1.0
355	Maria Slough tributary	0.9
328	Agassiz slough, southeast of	0.9
235	Nicomen Slough north bank	0.9
136	McIntyre Creek	0.9
60	Garry Point	0.9
398	Miami Creek area	0.8
307	Windermere Island	0.8
301	Fraser River, near Nelson Sloug	0.8
161	Fort Langley, nw of 88th. Avenu	0.8
226	Nicomen Island north central	0.7
223	Nicomen Slough, north shore	0.7
311	Fraser River, near Greyell Slou	0.6
164	Glover and Rawlinson Creeks	0.6
365	Fraser River, north of Herrling	0.5
299	Fraser River, Harrison R. mouth	0.5
278	Fraser R., near Nicomen Island	0.5
262	Yealstrick Island	0.5
242	Queens Island south shore	0.5
229	Nicomen Island central	0.5

228	Nicomen Island central	0.5
224	Nicomen Island north central	0.5
114	Fraser Glen House	0.5
105	Fraser Mills	0.5
329	Ferry Island slough, south shor	0.4
302	Fraser River, near Nelson Sloug	0.4
211	Neilson Regional Park	0.4
71	Canoe Pass south shore	0.4
362	Fraser River, north of Herrling	0.3
256	Fraser River, Nicomen Island ea	0.3
195	Hanna Creek	0.3
185	Palmateer Creek	0.3
184	West Creek	0.3
159	McMillan Island, near Fort Lang	0.3
12	Burrard Inlet east, south shore	0.3
384	Lake Errock	0.2
352	Maria Slough, west bank	0.2
340	Fraser River, west of Maria Slo	0.2
272	Fraser River, near Yaalstrick I	0.2
269	Fraser R., near Chilliwack Moun	0.2
214	Chilqua Slough, north of	0.2
303	Fraser River, near Nelson Sloug	0.1
199	Creek mouth, west of McLennan C	0.1
99	New Westminster waterfront	0.1
		26981.0

WETLAND UNIT NO.	LOCATION	SWAMP
113	Surrey Bend	304.0
198	Matsqui Island	263.9
219	Strawberry Island	194.6
178	Campbell River, upper reach	78.9
181	Pepin Creek	65.7
217	Fraser River, north shore	52.5
293	Vedder River	52.4
108	Coquitlam River, lower reach	41.4
111	Douglas Island	38.0
156	Kanaka Creek	37.7
75	South Arm Marshes	28.5
74	Ladner Marsh	21.3
180	Bertrand Creek	18.7
197	Mandale Slough	18.5
79	Deas Island east	17.3
51	Fraser River Foreshore Park	12.7
58	Poplar Island	12.2
55	Burnaby Big Bend foreshore	10.0
179	Aldergrove, south of	9.9
152	Derby Reach west	9.6
4	Ambleside	8.1
136	McIntyre Creek	7.7
116	Pitt Meadows Fraser foreshore	7.7
147	Pitt Meadows Airport foreshore	7.5
148	Bishops Reach	7.0
89	Don and Lion Islands	6.6
155	Derby Reach east	6.4
78	Deas Island west	5.8
145	Barnston Island north	5.7
80	Green Slough	5.6
119	Pitt River mouth east	5.5
46	Bridgepoint to No. 8 Road	5.0
96	Annacis Island north	4.5
95	Purfleet Point, Annacis Island	4.1
53	Fraser River Foreshore Park	4.1
115	Pitt Meadows Fraser foreshore	3.9
85	Tilbury Island central	3.7
151	Derby Reach east	3.5
52	Fraser River Foreshore Park	3.5
160	Salmon River, near mouth of	3.4
86	Tilbury Island east	3.4
61	Steveston Island	2.9
199	Creek mouth, west of McLennan C	2.8
93	Fraser Surrey Docks	2.8
109	Tree Island	2.4
35	Camosun Bog, UBC Endowment Land	2.4
144	Barnston Island south	2.3
41	Sea Island southeast	2.2
107	Queens Reach north shore	2.1
97	Annacis Island south	1.8
146	Mann Point, Barnston Island	1.3
104	Sapperton Dyke	1.2
103	Sapperton Flats	1.2
88	Annacis Channel north shore	1.2
56	Tree Island area	1.2
105	Fraser Mills	1.1
83	Tilbury Slough	1.1
50	East of Boundary Road	1.1
38	McDonald Slough	0.9
40	Sea Island north	0.7
81	Deas Slough south shore	0.6
37	Southlands	0.6
48	Arthur Laing Bridge to Boundary	0.5
43	Swishwash Island	0.5
54	No. 8 Road to CN Bridge	0.4
42	Sea Island south	0.4
39	Marpole	0.4
295	Sweltzer Creek	0.3
110	Essondale Islets	0.2
		1437.1

APPENDIX E THE CANADIAN WETLAND CLASSIFICATION SYSTEM[4]

(as it pertains to this inventory)

WETLAND - land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity which are adapted to a wet environment.

Five classes of wetland are recognized: bog, fen, marsh, swamp and shallow open water. Each of these classes is further subdivided into 'forms'. A description of each class and form found in this study area is given below.

BOG - A peatland, generally with the water table at or near the surface, which may be raised or level with the surrounding terrain, is virtually unaffected by the nutrient-rich groundwaters from the surrounding mineral soils and is thus generally acid and low in nutrients. The dominant materials are weakly to moderately decomposed *Sphagnum* and woody peat, underlain at times by sedge peat. The soils are mainly Fibrisols, Mesisols, and Organic Cryosols (permafrost soils). Bogs may be treed or treeless, and they are usually covered with *Sphagnum* spp. and ericaceous shrubs.

Basin Bog - A bog situated in a basin that has an essentially closed drainage, receiving water from precipitation and from runoff from the immediate surroundings. The surface of the bog is flat, but the peat is generally deepest at the centre.

Domed Bog - A large (usually more than 500 m in diameter) bog with a convex surface, rising several meters above the surrounding terrain. The centre is usually draining in all directions. Small crescentic pools often form around the highest point. If the highest point is in the centre, the pools form a concentric pattern, or eccentric if the pattern is off-centre. Peat development is usually in excess of 3 m.

Flat Bog - A bog having a flat, featureless surface. It occurs in broad, poorly defined depressions. The depth of peat is generally uniform.

Shore Bog - A non-floating bog forming at the shore of a pond or lake. The bog surface is

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[4] National Wetlands Working Group. Ecological Land Classification Series No. 21.

elevated at least 0.5 m above the level of the lake and its rooting zone is not affected by lake water. The bog often encroaches over the lake as shown by underlying lacustrine peat sediments.

FEN - A peatland with the water table usually at or just above the surface. The waters are mainly nutrient-rich and minerotrophic from mineral soils. The dominant materials are moderately to well decomposed sedge and/or brown moss peat of variable thickness. The soils are mainly Mesisols, Humisols, and Organic Cryosols. The vegetation consists predominantly of sedges, grasses, reeds, and brown mosses with some shrubs and, at times, a sparse tree layer.

Shore Fen - A fen with an anchored surface mat that forms the shore of a pond or lake. The rooting zone is affected by the water of the lake at both normal and flood levels.

Stream Fen - A fen located in the main channel or along the banks of permanent or semi-permanent streams. This fen is affected by the water of the stream at normal and flood stages.

MARSH - A mineral wetland or a peatland that is periodically inundated by standing or slowly moving water. Surface water levels may fluctuate seasonally, with declining levels exposing drawdown zones of matted vegetation or mud flats. The waters are rich in nutrients, varying from fresh to highly saline. The substratum usually consists of mineral material, although occasionally it consists of well-decomposed peat. The soils are predominantly Gleysols, with some Humisols and Mesisols. Marshes characteristically show zonal or mosaic surface patters composed of pools or channels interspersed with clumps of emergent sedges, grasses, rushes, and reeds, bordering grassy meadows and peripheral bands of shrubs or trees. Submerged and floating aquatics flourish where open water areas occur.

Active Delta Marsh - A marsh occupying lowlands on deltas, usually with drainage connections to active river channels. The marsh is subject to inundation at least once during a season, followed by a slow drawdown of the water levels. A high rate of sedimentation may occur in many parts of the marsh.

Coastal Marsh - A marsh influenced by brackish or saline waters of tidal marine origin. It occurs on marine terraces, flats, embayment, or lagoons.

High Marsh - located above mean high-water levels and is inundated only by flood tides.

Low Marsh - located below mean high-water levels and is inundated daily.

Estuarine Marsh - A marsh influenced by waters of varying salinity and of tidal marine origin. It occurs in river estuaries or in connected bays.

High Marsh - located above mean high-water levels and is inundated only at highest tides and/or storm surges.

Low Marsh - located below mean high-water levels and is frequently inundated.

Floodplain Marsh - A marsh occurring on fluvial floodplains adjacent to river channels. The marsh is subject to annual flooding and sedimentation for various lengths of time, with possibly some water impounded on the marsh following flooding.

Seepage Track Marsh - A marsh occupying spring or water discharge sites on or at the base of slopes. This marsh features saturated, quaking ground, flowages or drainage tracks, and occasional open pools where drainage is impeded.

Shallow Basin Marsh - A marsh occurring in a uniformly shallow depression or swale, having a gradual gradient from the edge of the deepest portion. The marsh edge may be poorly defined due to rapidly receding water levels.

Shore Marsh - A marsh occupying the contact zone between high and low water marks bordering semi-permanent or permanent lakes. The marsh is usually found along protected shorelines, in lagoons behind barrier beaches, on islands, or in embayments. The marsh is subject to flooding by rises in lake levels, wave winds, or surface runoff.

Stream Marsh - A marsh occupying shorelines, bars, streambeds, or islands in continuously flowing water courses. The marsh is subject to prolonged annual flooding and is often covered by thick layers of sediment.

Terminal Basin Marsh - A marsh occurring in a topographically low catch basin situated at the terminal end of internal drainage systems receiving a variable water supply from surface runoff, channel wetlands, streams, or groundwater. The marsh has no overflow or drainage outlets and most water loss is due to evaporation.

Tidal Freshwater Marsh - A marsh located upstream from estuarine and coastal marshes. The marsh is characterized by almost freshwater conditions, plant and animal communities dominated by freshwater species, and daily, lunar tidal fluctuations.

SWAMP - A mineral wetland or a peatland with standing water or water gently flowing through pools or channels. The water table is usually at or near the surface. There is pronounced internal water movement from the margin or other mineral sources; hence the waters are rich in nutrients. If peat is present, it is mainly well-decomposed wood, underlain at times by sedge peat. The associated soils are Mesisols, Humisols, and Gleysols. The vegetation is characterized by a dense cover of deciduous or coniferous trees or shrubs, herbs, and some mosses.

Basin Swamp - A swamp developed in a topographically defined basin where the water is derived locally but may be augmented by drainage from other parts of the watershed. Accumulation of well-decomposed peat is shallow (less than 0.5 m) at the edge and may reach 2 m at the centre.

Floodplain swamp - A swamp occurring in a valley which may be inundated by a seasonally flooding river. Slow drawdown after flooding preserves a high water table for most of the growing season. Shallow peat development may be encountered.

Stream swamp - A swamp occurring along the banks of permanent or semi-permanent streams. The high water table is maintained by the level of water in the stream. The swamp is seasonally inundated, with subsequent sediment deposition.

SHALLOW WATER - Characteristic of intermittently or permanently flooded or seasonally stable water regimes, feature open expanses of standing or flowing water which are variously called ponds, pools, shallow lakes, oxbows, reaches, channels, or impoundments. Shallow water is distinguished from deep water by mid-summer water depths of less than 2 m, and from other wetlands by summer open water zones occupying 75% or more of the wetland surface area.

Large open water areas (greater than 8 ha), located within wetland complexes, should be classified separately as shallow water units, despite the area or extent of bordering vegetation zones. Periodic flooding may increase water depths, but during droughts, low flows, drainage, or intertidal periods, drawdown flats may be exposed.

Shallow water is distinguished from uplands and bordering wetland complexes by water-eroded shorelines, or by the landward margins of mud flats, floating mats, emergents, or shrubs. In the open water zone, living vegetation, if present, is confined to submerged and floating aquatic plant forms.

Delta Water - Shallow ponds occurring on deltas that have been impounded by the shifting of river channels and the deposition of sediments. Periodic flooding in the delta usually inundates the delta water body.

Estuarine Water - Estuarine channels or bays periodically inundated by water of varying salinity. The water is less than 2 m deep.

Kettle Water - Predominantly shallow ponds with deep central portions, occupying basins with moderately sloping sides. The water sources are surface runoff from the local catchment area and seepage inflow. Drainage is limited to subsurface seepage, or overflow during flooding.

Non-tidal Water - Brackish water bodies mainly in pools and ponds located above the mean high-tide zone. The water is less than 2 m deep.

Oxbow Water - Shallow pond or lakes in old, abandoned channels or rivers impounded behind natural levees on river floodplains. Periodic flooding by the river usually inundates the oxbow water body.

Shallow Basin Water - Shallow ponds located in gently sloping depressions, receiving water from the catchment area. The basin edges are usually poorly defined. Surplus water is drained by open outlets or by seepage.

Shore Water - Shallow water confined to the upper littoral or near-shore zone of permanent open water bodies. Shore water may occupy large portions of shallow bays or shoals, merging with deep water zones.

Stream Water - Inland, shallow, fresh to saline flowing water which flows continuously and is confined to a main water course. Seasonal periods of flood stages may occur.

Terminal Basin Water - Shallow ponds in topographically defined basins where incoming water is supplied by drainage of the upper catchment area, as well as from the immediate surroundings. Outlet channels are lacking.

Tidal Water - Coastal lagoons or bays influenced by tidal action and salt water of marine origin. The normal mean tide-water level is less than 2 m deep.

VEGETATION TYPES - The terms used to describe wetland types are based on the general physiognomy of the vegetation cover, rather than on species descriptions. The physiognomic terms, when used in conjunction with wetland forms, constitute the wetland types.

Coniferous Treed - This wetland type is dominated by needleleaf species in the tree layer (more than 5 m tall). The most common species are *Picea mariana* and *Larix laricina* which grow on organic soils and represent a characteristic type in the boreal forest regions. *Thuja occidentalis* is the most common species found in the nutrient-rich southern wetlands in eastern Canada, and *Pinus contorta, Thuja plicata,* and *Chamaecyparis nootkatensis* occur on the Pacific coast wetlands.

Hardwood Treed - This wetland type is dominated by broadleaf species in the tree layer (more than 5 m tall). The most common species are *Acer* spp., *Fraxinus nigra, Ulmus americana, Betula* spp., and *Populus balsamifera.* Wetlands of this type generally occur in mineral soils or on highly decomposed organic soils.

Tall Shrub - This wetland type includes both tall shrubs (more than 1.5 m) and medium shrubs (0.5-1.5 m). The species include true shrubs and stunted trees.

Low Shrub - This wetland type includes both low shrubs (0.1-0.5 m) and ground shrubs (less than 0.1 m).

Mixed Shrub - This wetland type includes tall shrubs (more than 1.5 m), medium shrubs (0.5-1.5 m), and low shrubs (0.1-0.5 m).

Forb - This wetland type is dominated by forb species (non-grassy herbs).

Grass - This wetland type is dominated by low, tall, or mixed grass species.

Reed - This wetland type is dominated by reed species (*Phragmites*).

Tall Rush - This wetland type is dominated by *Scirpus* spp. and *Typha* spp.

Low Rush - This wetland type is dominated by *Juncus* spp. and *Triglochin* spp.

Sedge - This wetland type is dominated by sedge (*Carex* spp. and *Eriophorum* spp.) vegetation.

Moss - This wetland type is dominated by moss species. The most common mosses are *Sphagnum*, feather-mosses (*Pleurozium* spp. *Hylocomium* spp., and *Ptilium* spp.) and brown mosses (*Drepanocladus* spp., *Scorpidium* spp., and *Tomenthypnum* spp.).

Floating Aquatic - This wetland type is dominated by plants with leaves floating on the surface of the water.

Submerged Aquatic - This wetland type is dominated by plants with leaves found mainly below the surface of the water.

Non-vegetated - This wetland type has a vegetation cover that occupies less than 5% of the surface.

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Index map for WETLANDS OF THE FRASER LOWLAND, 1989: An Inventory

by

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Canadian Wildlife Service

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